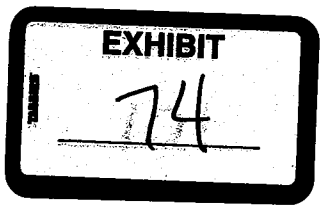
UNITED STATES DEPARTMENT OF AGRICULTURE

FARM SERVICE AGENCY

FINAL

Programmatic Environmental Assessment for Implementation of the Conservation Reserve Enhancement Program Agreement for Oklahoma

July 2006



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COVER SHEET

Proposed Action: The United States Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the Conservation Reserve Enhancement Program (CREP) agreement for the State of Oklahoma. CREP is a voluntary land conservation program for agricultural landowners.

Type of Statement: This programmatic environmental assessment (PEA) was prepared in accordance with the *National Environmental Policy Act* (42 *United States Code* 55 parts 4321 et seq., 2000), the Council on Environmental Quality implementing regulations (40 *Code of Federal Regulations* [CFR] 30 parts 1500 et seq., 2005), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 CFR 7 parts 799 et seq., 2006). This analysis is programmatic in nature and does not address individual site specific impacts, which would be evaluated for individual CREP contracts prior to approval.

Lead Agency: USDA FSA

Cooperating Agencies: USDA, Natural Resources Conservation Service, and the Oklahoma Conservation Commission

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Comments: Once this PEA is finalized, a Notice of Availability will be printed in newspapers within the vicinity of the CREP area. FSA will provide a public comment period prior to any FSA decision regarding the proposed action.

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EXECUTIVE SUMMARY

This programmatic environmental assessment identifies the possible environmental consequences resulting from the proposed implementation of the Conservation Reserve Enhancement Program agreement for the State of Oklahoma. The assessment process is designed to inform decision makers and the public about the potential environmental effects of the proposed action and to ensure public involvement in the process. The process will help decision makers take into account all environmental factors when making decisions related to the proposed action.

This programmatic environmental assessment has been prepared by the United States Department of Agriculture Farm Service Agency in accordance with the requirements of the *National Environmental Policy Act* (42 *United States Code* 55 parts 4321 et seq., 2000), the Council on Environmental Quality implementing regulations (40 *Code of Federal Regulations* 30 parts 1500 et seq., 2005), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 *Code of Federal Regulations* 7 parts 799 et seq., 2006).

Purpose and Need for the Proposed Action

The purpose of the proposed action is to implement Oklahoma's Conservation Reserve Enhancement Program agreement by removing up to 19,035 acres of riparian areas from agricultural use. Under this agreement, these lands would be enhanced by creating or restoring riparian buffers and reducing livestock access to floodplains in order to improve water quality in the Illinois River/Lake Tenkiller and Spavinaw Lake watersheds.

The Conservation Reserve Enhancement Program is needed to meet the following goals in Oklahoma:

- Improve overall water quality in two high priority watersheds
- Reduce phosphorus loading by 30 percent, nitrogen loading by 32 percent, and sediment loading by 30 percent
- Reduce excess nutrients in waterways caused by runoff from poultry litter
- Establish riparian buffers to help reduce overland flow of phosphorus to streams
- Restore riparian vegetation to stabilize stream banks and help reduce bank erosion
- Restrict livestock access to floodplains to decrease overland flow of pathogens to streams, and to decrease stream bank erosion and the subsequent sediment loading of streams
- Demonstrate both short-term and long-term benefits of riparian protection so that producers and other landowners are encouraged to utilize riparian protection as a standard part of land management.

Proposed Action and No Action Alternatives

This programmatic environmental assessment documents the analysis of the proposed action and no action alternatives. The proposed action would remove up to 19,035 acres from agricultural production and establish approved conservation practices on the land. Eligible land would be pasture or cropland located adjacent to waterbodies in the Illinois River/Lake Tenkiller and Spavinaw Lake watersheds.

The proposed action would provide participants with annual rental payments for the 15-year contract period. Rental payments would include a maintenance payment of $10.00 per acre and an additional maintenance fee for riparian buffers in the amount of 20 percent of the rental payment. Participants would also receive a one-time signing incentive payment of $150.00 per acre. In some cases, haying may be permitted on enrolled lands. The rental rate for lands with haying allowed would be 90 percent of the standard rental rate with no use of forage.

Participants would be compensated for conservation practice establishment costs. The Oklahoma Conservation Commission and the Farm Service Agency would pay a cost-share payment of up to 83 percent of the cost to establish the required cover. The Farm Service Agency would also issue a practice incentive payment equal to 40 percent of the practice establishment costs.

Under the no action alternative, lands would not be removed from agricultural production and conservation practices would not be implemented.

The Farm Service Agency has identified the proposed action as the preferred alternative because it is the alternative that would satisfy the purpose and need for the proposed action.

Summary of Environmental Consequences

It is expected that there would be both beneficial and temporary minor adverse impacts associated with implementation of the proposed action. A summary of the potential impacts is given in Table ES–1.

Table ES–1. Summary of potential impacts from implementation of the proposed action and no action alternatives.

Resource	Proposed Action	No Action
Biological Resources	• Increased quality and abundance of wildlife and fisheries habitat, including that of protected species • Establishment of migration corridors for wildlife and reduce fragmentation • Increased health and persistence of fish populations • Increased vegetation diversity • Long-term beneficial impacts to wildlife and fisheries and vegetation • Long-term beneficial impacts to six of ten protected species in the region of influence; potential adverse impacts to two protected species if riparian buffers are implemented within areas they utilize for habitat; negligible impact or slight benefit to remaining two protected species • Temporary adverse impacts due to human disturbance and increased sedimentation.	• Continued loss and degradation of wildlife and fisheries habitat • Increased fragmentation of wildlife habitat • Decreased health and persistence of fish populations • Continued alteration and depletion of native vegetation • Long-term adverse impacts to wildlife and fisheries, vegetation, and protected species.

Resource	Proposed Action	No Action
Cultural Resources	• High potential for encountering both recorded and unidentified archaeological and architectural sites and traditional cultural properties • Actions to be reviewed with the Oklahoma State Historic Preservation Office on a site specific basis, as appropriate • No anticipated impact to cultural resources.	• Continuation of farming not expected to impact resource • Potential adverse impacts if agricultural practices occur on previously undisturbed lands.
Water Resources	• Reduced nutrients, pathogens, and turbidity in streams • Reduced stream bank erosion and sediment loading • Increased capability of surface water to retain dissolved oxygen • Greater rates of aquifer recharge • Reduced pollutants and sediments in wetlands • Improved function of floodplains • Long-term beneficial impacts to surface water, groundwater, and wetlands.	• Continued degradation of surface water, groundwater, and wetlands due to high nutrient loading, turbidity, low dissolved oxygen content, high sedimentation levels, and the presence of pathogens • Continued algae blooms and potential fish kills • Long-term adverse impacts to water resources.
Soil Resources	• Reduced wind and water erosion • Stabilization of soils and topography • No anticipated impact to paleontological resources • Temporary increase in erosion during implementation.	• Continuation of current rates of erosion and changes in topography. • No anticipated impact to paleontological resources.
Air	• Increased vegetation would reduce erosion and provide beneficial local impacts to air quality • May enhance carbon sequestration • Temporary, minor adverse impacts during implementation activities.	• No impact to existing conditions.
Recreation	• Increased opportunities for hunting, fishing, and wildlife viewing	• No impact to existing conditions.

Resource	Proposed Action	No Action
	• Improved water quality and aesthetics • Temporary displacement of wildlife may occur during implementation • Long-term beneficial impacts to recreation.	
Socio-economics	• Positive net present value for land rentals • Implementation would create total net present value of $22.0 million over 15 years • Increased recreation opportunities would generate economic activity.	• Socioeconomic conditions would continue to follow current trends.
Environmental Justice	• Loss of 72 farm worker positions (estimated cost of $424,225 per year) in poverty area • Installation and maintenance of conservation practices may create new positions • Conservation Reserve Enhancement Program payments may generate additional non-farm employment within the community.	• No impact to existing conditions.
Wild and Scenic Rivers	• Reduced nutrients, pathogens, and turbidity in scenic rivers • Reduced stream bank erosion and sediment loading • Increased capability of scenic rivers to retain dissolved oxygen • Long-term beneficial impacts to scenic rivers.	• Continued degradation of scenic rivers due to high nutrient loading, turbidity, low dissolved oxygen content, high sedimentation levels, and the presence of pathogens • Continued algae blooms and potential fish kills • Long-term adverse impacts to scenic rivers.

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ACRONYMS AND ABBREVIATIONS

AFS	American Fisheries Society
ASWM	Association of State Wetland Managers
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BMP	best management practice
BP	before present
CCC	Commodity Credit Corporation
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CWS	Canadian Wildlife Service
CP	conservation practice
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
EO	Executive Order
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FEMA	Federal Emergency Management Agency
FR	*Federal Register*
FRPP	Farm and Ranch Land Protection Program
FSA	Farm Service Agency
FWS	Fish and Wildlife Service
GMA	game management area
gpm	gallons per minute
GRP	Grassland Reserve Program
HFRP	Healthy Forests Reserve Program

LMBV	largemouth bass virus
NAAQS	National Ambient Air Quality Standards
NEPA	*National Environmental Policy Act*
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSFHWAR	National Survey of Fishing, Hunting, and Wildlife-Associated Recreation
NWR	national wildlife refuge
OAS	Oklahoma Archeological Survey
OCC	Oklahoma Conservation Commission
ODEQ	Oklahoma Department of Environmental Quality
ODWC	Oklahoma Department of Wildlife Conservation
OES	Oklahoma Ecological Services
OSHPO	Oklahoma State Historic Preservation Office
OSRC	Oklahoma Scenic Rivers Commission
OWRB	Oklahoma Water Resources Board
PEA	programmatic environmental assessment
ROI	region of influence
SWCAP	Soil and Water Conservation Assistance Program
TCP	traditional cultural property
TMDL	total maximum daily load
USACE	U.S. Army Corps of Engineers
USC	*United States Code*
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WHIP	Wildlife Habitat Incentives Program
WMA	wildlife management area

WRP Wetlands Reserve Program

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1.0 INTRODUCTION

The United States Department of Agriculture (USDA) Farm Service Agency (FSA) proposes to implement the Conservation Reserve Enhancement Program (CREP) agreement for the State of Oklahoma (Appendix A). This programmatic environmental assessment (PEA) has been prepared to analyze the potential environmental consequences associated with the proposed action and no action alternatives in accordance with the *National Environmental Policy Act* (NEPA) (42 *United States Code* [USC] 55 parts 4321 et seq., 2000), the Council on Environmental Quality (CEQ) implementing regulations (40 *Code of Federal Regulations* [CFR] 30 parts 1500 et seq., 2005), and *Environmental Quality and Related Environmental Concern—Compliance with the National Environmental Policy Act* (7 CFR 7 parts 799 et seq., 2006). This analysis is programmatic in nature and does not address individual site specific impacts, which would be evaluated for individual CREP contracts prior to approval.

1.1 Background

FSA was established during the reorganization of USDA in 1994. The mission of FSA is to:

> "...ensure the well-being of American agriculture and the American public through efficient and equitable administration of agricultural commodity, farm loan, conservation, environmental, emergency assistance, and domestic and international food assistance programs." (FSA 1997)

The Conservation Reserve Program (CRP) was established under Title XII of the *Food Security Act of 1985* (16 USC 58 part 3831, 1996). The purpose of CRP is to cost-effectively assist owners and operators in conserving and improving soil, water, and wildlife resources on their farms and ranches. Highly erodible and other environmentally sensitive acreage, normally devoted to the production of agricultural commodities, is converted to a long-term resource conservation cover. CRP participants enter into contracts for periods of 10 to 15 years in exchange for annual rental payments and cost-share assistance for installing certain conservation practices (CPs).

The *Farm Security and Rural Investment Act of 2002*, commonly known as the *2002 Farm Bill*, authorizes CRP through 2007 and raises the overall enrollment cap to 39.2 million acres (16 USC 58 part 3831, 1996). The *Conservation Reserve Program Final Programmatic Environmental Impact Statement* contains a detailed analysis of the impacts of implementing CRP nationwide, including the CREP component (FSA 2003a).

The Secretary of Agriculture initiated CREP in 1997. CREP is authorized pursuant to the *Federal Agriculture Improvement and Reform Act of 1996* and is a subset of CRP (7 USC 100 parts 7201 et seq., 1998). This program is based on the continuous CRP model but differs in four important ways (FSA 2006):

- CREP is targeted to specific geographic areas and designed to focus CPs on addressing specific environmental concerns.
- CREP is a partnership between USDA, State and/or tribal governments, other Federal and State agencies, environmental groups, wildlife groups, and other stakeholders who have an interest in addressing particular environmental issues.
- CREP is results-oriented, and requires States to establish measurable objectives and conduct annual monitoring to measure progress toward implementation of those objectives.

- CREP is flexible, within existing legal constraints, and may be adapted to meet local conditions on the ground.

This voluntary program uses financial incentives to encourage farmers and ranchers to enroll in contracts of 10 to 15 years in duration to remove lands from agricultural production. The two primary objectives of CREP are to:

- Coordinate Federal and non-Federal resources to address specific conservation objectives of a State and the Nation in a cost-effective manner.

- Improve water quality, erosion control, and wildlife habitat related to agricultural use in specific geographic areas.

CRP and CREP are administered by FSA in cooperation with the Natural Resources Conservation Service (NRCS), and the Oklahoma Conservation Commission (OCC). FSA is the lead agency in the development of this PEA.

1.1.1 Regulatory Compliance

This PEA has been completed as part of the NEPA process and is in compliance with CEQ and FSA implementing regulations (40 CFR 30 parts 1500 et seq., 2005; 7 CFR 7 parts 799 et seq., 2006). The intent of NEPA is to protect, restore, and enhance the human environment through well-informed Federal decisions. The following non-exclusive list of higher-tier executive orders (EOs), acts, and relevant decision and guidance documents apply to actions undertaken by Federal agencies and form the basis of the analysis presented in this PEA (see Appendix B for summaries):

- *Clean Air Act* (42 USC 85 parts 7401 et seq., 1999)

- *Clean Water Act* (33 USC 26 parts 1251 et seq., 2000)

- *Endangered Species Act of 1973*, as amended (16 USC 35 parts 1531 et seq., 1988)

- EO 11514, *Protection and Enhancement of Environmental Quality* (35 *Federal Register* [FR] 4247, 1977)

- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 32, 1995)

- *National Historic Preservation Act of 1966*, as amended (16 USC 1A part 470, 2000).

1.2 Purpose and Need for Action

The purpose of this action is to implement Oklahoma's CREP agreement to reduce nutrient and sediment loading in two high priority watersheds by restoring riparian buffers and reducing livestock access to floodplains. Under this agreement, eligible farm land would be planted in grass, shrubs, and trees.

The Oklahoma CREP agreement is needed to:

- Improve overall water quality in two high priority watersheds

- Establish riparian buffers to help reduce overland flow of nutrients to streams

- Restore riparian vegetation to stabilize stream banks and help reduce bank erosion
- Restrict livestock access to floodplains to decrease overland flow of pathogens to streams, and to decrease stream bank erosion and the subsequent sediment loading of streams
- Encourage landowners to view riparian protection as a standard practice of land management.

1.3 Objectives

CREP agreements are designed to meet specific regional conservation goals and objectives related to agriculture. The proposed agreement with Oklahoma is focused on improving water quality in two high priority watersheds in eastern Oklahoma, the Illinois River/Lake Tenkiller and the Spavinaw Lake watersheds (herein referred to as the *Tenkiller* and *Spavinaw watersheds*) (Figure 1). These watersheds were selected for participation because their water quality problems are representative of other watersheds within the region and they would serve to demonstrate the benefits of riparian protection for acceptance by landowners across the region.

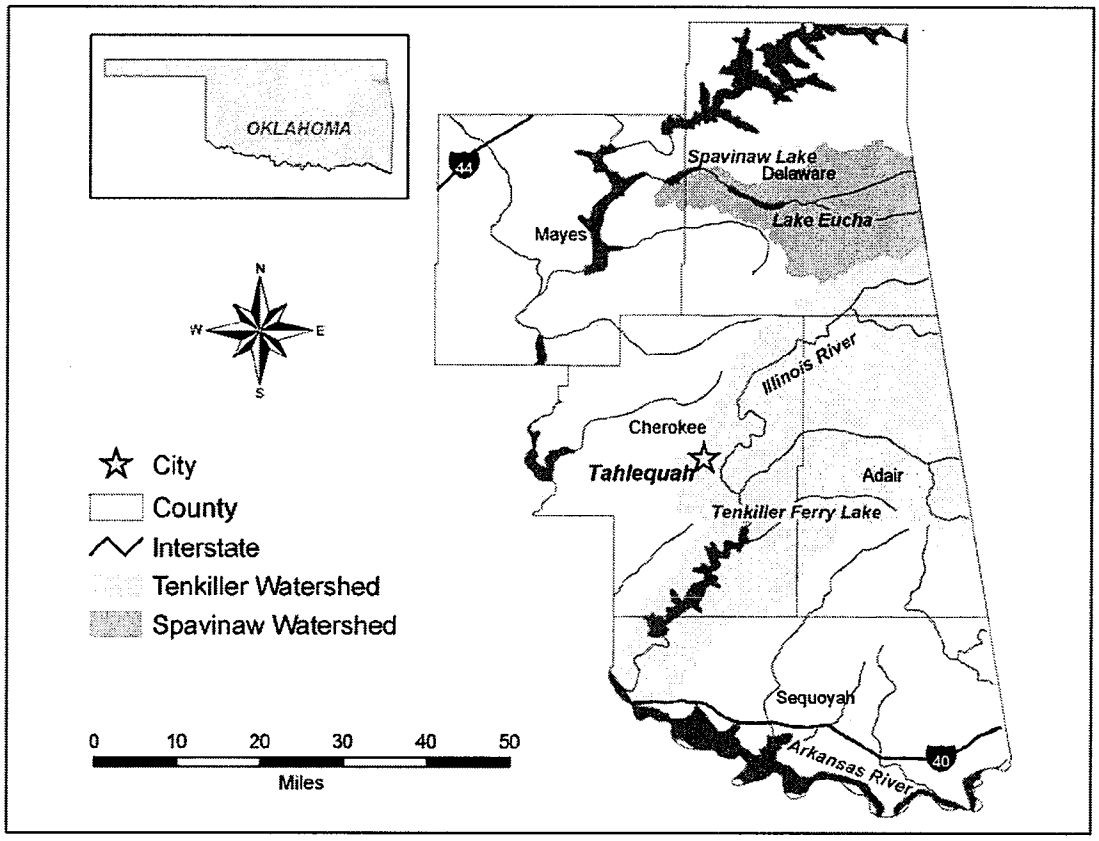

Figure 1. Oklahoma watersheds proposed for CREP enrollment.

Water quality problems in the Tenkiller and Spavinaw watersheds are due to excess nutrients, pathogenic bacteria, and sedimentation. These watersheds are major poultry growing and cattle producing areas, and a common practice has been to fertilize the soil for grazing purposes by applying poultry litter. This practice has led to the excessive buildup of phosphorus that currently pollutes waterbodies in the ROI. Excess nutrients have also caused low dissolved oxygen levels in these

waterways. Livestock access to floodplains has contributed to stream impairments from pathogenic bacteria and sedimentation.

The primary objective of the Oklahoma CREP agreement is to reduce nutrient and sediment input to specific watersheds. This would be accomplished by restoring riparian buffers to these systems and reducing livestock access to floodplains. These actions would result in less overland flow of nutrients, sediments, and pathogens to streams and less stream bank erosion. This, in turn, would result in better water quality, lower maintenance requirements to the road and highway system, and would help to preserve existing floodplain pasture. A secondary goal of CREP is to demonstrate the short-term and long-term benefits of riparian protection so that producers and other landowners will eventually accept riparian protection as a standard part of land management.

Under the proposed CREP agreement, farmers and ranchers who voluntarily participate would enter into contracts with the Federal government for 15 years, agreeing to remove portions of their land from agricultural production and plant them to grass, shrubs, and trees.

The Oklahoma CREP agreement would intend on enrolling up to 19,035 acres of riparian land within the Tenkiller and Spavinaw watersheds. This would include up to 15,172 acres in the Tenkiller watershed and up to 3,863 acres in the Spavinaw watershed. These watersheds were delineated by OCC and correspond roughly to the 11-digit hydrological unit codes in Oklahoma as mapped by the U.S. Geological Survey (USGS).

As the exact location of parcels that might be enrolled in CREP is not known at this time, the region of influence (ROI) for this PEA is considered to be 805,000 acres within the following areas:

- Tenkiller watershed (575,000 acres)—in Adair, Cherokee, Delaware, and Sequoyah counties
- Spavinaw watershed (230,000 acres)—in Delaware and Mayes counties.

The specific goals and objectives for the Oklahoma CREP agreement include the following:

- Establish up to 19,035 acres of riparian buffer in two high priority watersheds
- Reduce excess nutrients in waterways caused by runoff from poultry litter
- Reduce phosphorus loading by 30 percent, nitrogen loading by 32 percent, and sediment loading by 30 percent in these watersheds
- Demonstrate short-term and long-term benefits of riparian protection so that producers and other landowners are encouraged to utilize riparian protection as a standard part of land management.

The intended outcome of the Oklahoma CREP agreement is to enhance the ability of producers to enroll certain acreage under CRP where deemed desirable by USDA and the Commodity Credit Corporation (CCC). CCC is a Federal entity within USDA that was created to stabilize, support, and protect agricultural income and prices.

1.4 Organization of the PEA

This PEA discloses the potential impacts of the proposed action and no action alternatives on affected environmental and economic resources. Chapter 1.0 provides background information relevant to the proposed action and discusses the purpose and need for the proposed action. Chapter 2.0 describes the

proposed action and no action alternatives. Chapter 3.0 describes the baseline conditions (i.e., the conditions against which potential impacts of the proposed action and no action alternatives are measured) for each of the resource areas. Chapter 4.0 explains the potential environmental impacts to these resources. Chapter 5.0 provides an analysis of cumulative impacts and irreversible resource commitments. Chapter 6.0 describes mitigations to reduce potential impacts of the proposed action. Chapter 7.0 is a list of the preparers of this document, and Chapter 8.0 lists those persons and agencies contacted during the preparation of this document. Chapter 9.0 is a glossary of terms and Chapter 10.0 contains references used in the PEA.

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2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the alternatives, which include the proposed action and no action alternatives. These two alternatives are compared in terms of their environmental impacts and ability to achieve the objectives listed in Section 1.3. FSA has identified the proposed action as the preferred alternative because it is the alternative that would satisfy the purpose and need for the proposed action.

2.1 Proposed Action (Preferred Alternative)

The Oklahoma CREP agreement would enroll up to 19,035 acres of riparian areas in CRP (Table 1). Once the CREP agreement is approved, landowners would enroll eligible lands in the program on a voluntary basis. As such, the exact location of parcels that might be enrolled is not known at this time.

To be eligible, land must be pasture or cropland located adjacent to streams, rivers, or lakes in the Tenkiller or Spavinaw watersheds. Cropland must have been planted or considered planted to a crop in two of the five previous years, and must be physically and legally capable of being used for crop production. Marginal pastureland may also be enrolled provided it is suitable for use as a riparian buffer planted to trees, wildlife habitat buffer, or wetland buffer. In addition, land must have been owned or operated by the applicant for the previous 12 months. If the land is currently enrolled in CRP, that contract must expire before the land is considered eligible for enrollment in CREP.

2.1.1 Established Conservation Practices

The CPs proposed for implementation under the Oklahoma CREP agreement are CP21—Filter Strips and CP22—Riparian Buffer. These CPs would be installed on eligible land and according to rules in *Agricultural Resource Conservation Program for State and County Offices* (FSA 2003b). A detailed description of each practice is provided in Appendix C.

Preparation of lands for installation of CPs may include removal of existing vegetation or rocks through the use of tilling, burning, or approved agricultural chemicals. Temporary covers may be installed. Earth moving equipment may be used to construct surface dikes, dams, levies, and subsurface piping and structures to regulate water flow. Fire breaks, fencing, and roads may also be installed.

Table 1. Land in farms for the counties that are partially within the watersheds proposed for CREP enrollment.

County	Watershed	Total Acres in County	Acres in Farms	Percentage of Total Land in Farms
Adair	Tenkiller	368,639	237,874	64.5
Cherokee	Tenkiller	480,638	220,739	45.9
Delaware	Tenkiller, Spavinaw	474,238	282,106	59.5
Mayes	Spavinaw	419,838	302,172	72.0
Sequoyah	Tenkiller	431,358	222,350	51.5
Source: USDA 2004, USCB 2000a				

2.1.2 Financial Support to Land Owners

The preferred alternative would provide the participant with annual rental payments for the 15-year contract period. Rental payments would include a maintenance payment of $10.00 per acre and an

additional maintenance fee for riparian buffers in the amount of 20 percent of the rental payment. Participants would also receive a one-time signing incentive payment of $150.00 per acre. In some cases, haying may be permitted on enrolled lands. The rental rate for lands with haying allowed would be 90 percent of the standard rental rate with no use of forage.

Participants would be compensated for practice establishment costs. OCC and FSA would pay a cost-share payment of up to 83 percent of the cost to establish the required conservation cover. FSA would also issue a practice incentive payment equal to 40 percent of the practice establishment costs.

2.2 Scoping

2.2.1 Discussion

Scoping is a process used to identify any issues that may affect environmental and social resources as a result of the proposed action, and to explore other possible ways of achieving objectives while minimizing adverse impacts. Regulatory agencies, tribal representatives, FSA specialists, and other interest groups were contacted to refine the project purpose and need, to designate resources of potential impact, and to develop preliminary alternatives.

Public involvement commenced on March 20, 2006, with letters mailed to 21 persons and agencies. A list of those contacted is available in Chapter 8 of this document. These letters included a summary of the proposed action and alternatives and solicitation for comment. No comments were received.

2.2.2 Resources Considered but Eliminated from Analysis

CEQ implementing regulations require that issues which are not significant or which have been covered by prior environmental review be identified and eliminated from detailed study (40 CFR 30 parts 1500 et seq., 2005). Accordingly, several resources have been eliminated from further analysis in this PEA. These resources and the reasons for exclusion are provided in the following discussion.

Sole Source Aquifers

The Environmental Protection Agency (EPA) defines a sole source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water (EPA 2006a). There are no sole source aquifers within the ROI (EPA 2005a).

Coastal Zones

There are no coastal zones in or near the ROI.

Noise

The proposed action would not permanently increase ambient noise levels within the ROI. Noise levels may increase slightly during installation of CPs, but this increase would be temporary and would cease after CP installation.

Traffic and Transportation

The proposed action would have no impact to existing traffic and transportation conditions in the ROI.

Human Health and Safety

The proposed action would not have any permanent or significant impact to human health and safety in the ROI.

National Natural Landmarks

A national natural landmark is an area designated by the Secretary of the Interior as being of national significance because it is an outstanding example of major biological and geological features found within the boundaries of the U.S. (36 CFR 1 parts 62.1–62.9, 2005). There are no national natural landmarks in the ROI.

Wilderness

A wilderness area is federally-owned land that has been designated by Congress for inclusion in the National Wilderness Preservation System. There are no wilderness areas in the ROI (16 USC 23 parts 1131 et seq., 1964).

2.3 Alternatives Eliminated from Analysis

No alternatives were eliminated from analysis.

2.4 Alternatives Selected for Analysis

2.4.1 Alternative A—Preferred Action

Alternative A, the preferred action, would implement the Oklahoma CREP agreement by enrolling up to 19,035 acres of riparian areas in the Tenkiller and Spavinaw watersheds in CRP. Filter strips and riparian buffers would be installed on eligible land to reduce nutrient and sediment input and improve overall water quality in the watersheds. Participants would receive annual rental and maintenance payments for the 15-year contract periods, as well as one-time signing incentive payments.

2.4.2 Alternative B—No Action

Alternative B, the no action alternative, would involve not implementing the Oklahoma CREP agreement. No land would be enrolled in CRP, and the goals for the Oklahoma CREP would not be met. This alternative would result in a continuation of current agricultural practices and the degradation of water quality due to excess nutrients and sediments.

2.5 Comparison of Alternatives

2.5.1 Identification of Geographical Boundaries

The proposed project area (i.e., ROI) is riparian land in the Tenkiller and Spavinaw watersheds. These high priority watersheds are located in the northeastern portion of Oklahoma (Figure 1). The Oklahoma CREP agreement would intend on enrolling up to 15,172 acres within the Tenkiller watershed, and up to 3,863 acres within the Spavinaw watershed. These watersheds encompass portions of Adair, Cherokee, Delaware, Mayes, and Sequoyah counties. There are no major cities within the proposed project area.

2.5.2 Identification of Temporal Boundaries

Agricultural land owners that participate in CREP would enroll lands for contracts of 15 years. It is anticipated that all eligible contracts would be signed within 3 years of the project opening date, which would roughly establish the year 2024 as the temporal boundary for the purposes of this analysis.

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3.0 AFFECTED ENVIRONMENT

This chapter describes relevant existing conditions for the resources potentially affected by the proposed action and no action alternatives. In compliance with guidelines contained in NEPA and CEQ regulations, the description of the affected environment focuses on those aspects potentially subject to impacts. Resources within the ROI are analyzed by watersheds or by counties, depending on the spatial character of the available data.

3.1 Biological Resources

3.1.1 Wildlife and Fisheries

3.1.1.1 Description

Wildlife and fisheries include terrestrial, avian, and aquatic species and the habitats in which they occur. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.1.1.2 Affected Environment

3.1.1.2.1 Wildlife

The Oklahoma Department of Wildlife Conservation (ODWC) has full and complete authority to manage the wildlife of Oklahoma. This includes approximately 51 species of amphibians, 356 species of birds, 175 species of fish, 58 species of invertebrates, 106 species of mammals, and 83 species of reptiles (ODWC 2005a). ODWC sets the hunting regulations for game species in Oklahoma, which include white-tail deer, elk, feral hogs, small game, upland game, furbearing animals, waterfowl and webless birds (Tables 2 and 4) (ODWC 2005b). ODWC also has authority over non-game species (i.e., species that are not hunted, fished or trapped).

Table 2. Common and scientific names of game species in the ROI.

Common Name	Scientific Name	Common Name	Scientific Name
Badger	*Taxidea taxus*	Mourning dove	*Zenaida macroura*
Beaver	*Castor canadensisis*	Muskrat	*Ondatra zibethicus*
Bobcat	*Lynx rufus*	Nutria	*Myocastor coypus*
Bobwhite quail	*Colinus virginianus*	Opossum	*Didelphis virginiana*
Common snipe	*Gallinago gallinago*	Pheasant	*Phasianus colchicus*
Cottontail rabbit	*Sylvilagus floridanus*	Prairie dog	*Cynomys ludovicianus*
Coyote	*Canis latrans*	Raccoon	*Procyon lotor*
Crow	*Corvus brachyrhynchos*	Scaled Quail	*Callipepla squamata*
Eastern gray squirrel	*Sciurus carolinensis*	Striped skunk	*Mephitis mephitis*
Eastern fox squirrel	*Sciurus niger*	Swamp rabbit	*Sylvilagus aquaticus*
Eurasian collared dove	*Streptopelia decaocto*	Turkey	*Meleagris gallopavo*
Feral hog	*Sus scrofa*	Weasel	*Mustela sp.*
Gray fox	*Urocyon cinereoargenteus*	White-tail deer	*Odocoileus virginianus*

Common Name	Scientific Name	Common Name	Scientific Name
Jackrabbit	*Lepus townsendii*	White-winged dove	*Zenaida asiatica*
Mink	*Mustela vison*	Woodcock	*Scolopax minor*
Source: ODWC 2005b			

White-Tail Deer

White-tail deer hunting is the most popular season in the State. These deer, once nearly extirpated from the State, can now be found in all 77 Oklahoma counties. Surveys indicate that the average buck in Oklahoma weighs between 80 and 105 pounds. Average doe weight is 74 to 98 pounds. Largely due to the production of hard mast and excellent and diverse habitat, over 100 deer checked in during the 2002 hunting season weighed 200 pounds or more (Lambeth 2002).

White-tail deer, both bucks and does, can be taken by bow, gun, or primitive muzzleloader. There were 11,248 deer (6,530 bucks and 4,718 does) taken in the Tenkiller and Spavinaw watersheds in 2004 (Table 3) (ODWC 2004a). Cherokee County had the highest take of all Oklahoma counties in the 2004 season.

Table 3. White-tail deer take in the ROI in 2004.

County	White-Tail Deer		
	Total	Bucks	Does
Adair	1,618	984	634
Cherokee	3,405	1,882	1,523
Delaware	2,240	1,269	971
Mayes	1,798	1,059	739
Sequoyah	2,187	1,336	851
Source: ODWC 2004a			

Feral Hogs

The three types of wild hogs in Oklahoma are feral hogs, Eurasian (Russian) wild boars, and a hybrid cross of the two (Stevens 1999). Feral hogs are found throughout many Oklahoma counties and may be found within the ROI. Feral hogs can generally adapt to any habitat, but they prefer moist bottomlands and streams and rivers. Feral hogs are omnivorous, with a vast diet that can include grasses, forbs, roots, tubers, grapes, plums, pears, acorns, mushrooms, hard and soft mast, birds, snails, insects, eggs, worms, carrion, and agricultural crops such as peanuts, oats, wheat, soybeans, and corn (Stevens 1999).

Small Game

Small game hunting in Oklahoma includes the take of rabbits and squirrels. The three species of rabbits in the State are cottontails (*Sylvilagus floridanus*), swamp rabbits (*Sylvilagus aquaticus*), and jackrabbits (*Lepus townsendii*) (ODWC 2005b). ODWC allows the hunting of two species of squirrel; the eastern fox squirrel (*Sciurus niger*) and the eastern gray squirrel (*Sciurus carolinensis*) (ODWC 2005b). All of these small game species have the potential to occur in the ROI.

Upland Game

Upland game species in Oklahoma include wild turkey, bobwhite quail, scaled quail, and pheasants (ODWC 2005b). Though once thought to be nearly extirpated from the State, wild turkeys are currently

turkey (*Meleagris gallopavo intermedia*) occurs in the western portion of Oklahoma. The eastern turkey (*Meleagris gallopavo silvestris*) occurs more in the eastern portion of the State. ODWC sets regulations for fall and spring turkey seasons.

Wild turkey habitat includes locations that provide roosting areas, nesting cover, water, food, escape cover, and brood rearing areas (Bidwell 2005). Roosting trees should have open canopies and large horizontal limbs. Nesting cover is normally located in thick ground cover such as grass, shrubs, alfalfa fields, huckleberry bushes, and grape vines, and areas around stream banks. Turkeys forage on a variety of items, such as berries, seeds, green leaves, insects, snails, and soft mast (Bidwell 2005). Feeding areas must have escape cover to protect the birds during foraging. Brood rearing areas are vicinities with grass or crop stubble, where insects are numerous and protective cover is available. Turkeys require water every day. If standing water is not available, turkeys will glean water off vegetation to fulfill their daily requirements (Bidwell 2005).

There are two subspecies of bobwhite quail that occur in Oklahoma; the eastern bobwhite (*Colinus virginianus virginianus*) and the plains bobwhite quail (*Colinus virginianus taylori*) (ODWC 2005b). Eastern bobwhites occur in only the extreme southeast corner of the State, and probably not within the ROI. Plains bobwhites can be found throughout the State and in the ROI. Bobwhite quail habitat includes areas of warm season grasses with clumps of low, brushy, woody vegetation. Populations have been found to thrive in edge habitats, which are transition areas between two different vegetation types (e.g., forest to grass).

Scaled quail occur mostly in the Oklahoma panhandle and are unlikely to be found in the ROI (ODWC 2005b). Their habitat includes arid grassland and desert scrub areas.

Ring-neck pheasants occur mostly in the north-central and northwestern portions of Oklahoma, and are unlikely to be found in the ROI (ODWC 2005b). Pheasants prefer agricultural farmlands, such as cultivated fields surrounded by fence rows or shrubby vegetation, as primary habitat. The ring-neck pheasant diet includes waste grains, insects, and weed seeds.

Furbearing Animals

Furbearer harvest in Oklahoma includes the take of raccoon, badger, mink, muskrat, opossum, weasel, bobcat, beaver, nutria, striped skunk, coyote, and gray fox (ODWC 2005b). These species have the potential to occur within the ROI. Participating in furbearer harvest in Oklahoma requires a hunting license and trapping license; however furbearing animals found destroying livestock or poultry may be taken at any time (ODWC 2005b).

Waterfowl and Webless Birds

ODWC sets the regulations for waterfowl and migratory bird hunting, which encompasses the take of ducks, geese, and other webless game birds (Table 4) (ODWC 2005b). Oklahoma is within the Central Flyway Zone that includes Montana, Wyoming, Colorado, New Mexico, Texas, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, Alberta, Saskatchewan, and the Northwest Territories.

Non-Game Species

Oklahoma has over 900 non-game species within the State such as bats, voles, gophers, and mice. Non-game migratory species include owls, hawks, and songbirds. Black bear, mountain lion, red fox, river otter, swift fox, spotted skunk, and ringtail were all game species at one time in Oklahoma; however, population declines limited them throughout the State and led ODWC to close hunting seasons year round for these species (ODWC 2005b). The ROI is rich in non-game species such as bats and songbirds.

Table 4. Common and scientific names for waterfowl and webless game bird species in Oklahoma.

Common Name	Scientific Name	Common Name	Scientific Name
American widgeon	*Anas americana*	Lesser scaup	*Aythya affinis*
Black rail	*Laterallus jamaicensis*	Mallard	*Anas platyrhynchos*
Blue-winged teal	*Anas discors*	Northern pintail	*Anas acuta*
Bufflehead	*Bucephala albeola*	Northern shoveler	*Anas clypeata*
Canada goose	*Branta canadensis*	Red-breasted merganser	*Mergus serrator*
Canvasback	*Aythya valisineria*	Redhead	*Aythya americana*
Cinnamon teal	*Anas cyanoptera*	Ring-neck duck	*Aythya collaris*
Coots	*Fulica atra*	Ross goose	*Chen rossii*
Common goldeneye	*Bucephala clangula*	Ruddy duck	*Oxyura jamaicensis*
Common loon	*Gavia immer*	Sandhill crane	*Grus canadensis*
Common merganser	*Mergus merganser*	Snow goose	*Chen caerulescens*
Common moorehen	*Gallinula chloropus*	Sora	*Porzana*
Gadwall	*Anas strepera*	Virginia rail	*Rallus limicola*
Greater scaup	*Aythya marila*	White-fronted goose	*Anser albifrons*
Hooded merganser	*Lophodytes cucullatus*	Wood duck	*Aix sponsa*
King rail	*Rallus elegans*		
Source: ODWC 2005a			

3.1.1.2.2 Fisheries

ODWC safeguards and makes regulations for management of approximately 175 fish species that occur throughout the State (Appendix D). Game fish include species such as bass, catfish, crappie, walleye, and trout (Table 5) (American Fisheries Society [AFS] 2005). Oklahoma supplements its game fish population with hatchery-raised fish from four State hatcheries and one national hatchery managed by the U.S. Fish and Wildlife Service (FWS). The Durant, Holdenville, Byron, and J.A. Manning State hatcheries and the Greer's Ferry National Fish Hatchery provide anglers with increased fishing opportunities, as well as provide fish to private pond owners.

Waterways within the ROI have been inflicted with such impairments as excess nutrients, low dissolved oxygen content, the presence of pathogens, and high levels of turbidity. These impairments may limit the variance of aquatic life (EPA 2002a). Algae blooms due to phosphorus loading in waterways have been a contributor to summer fish kills.

Table 5. Popular game fish in Oklahoma.

Common Name	Scientific Name	Common Name	Scientific Name
Bass, largemouth	*Micropterus salmoides*	Crappie, white	*Pomoxis annularis*
Bass, smallmouth	*Micropterus dolomieu*	Sauger	*Sander canadense*
Bass, spotted	*Micropterus punctulatus*	Saugeye	*Stizostedion canadense x Stizostedion vitreum vitreum*
Bass, stripped	*Morone saxatilis*	Shadowbass	*Ambloplites ariommus*

Common Name	Scientific Name	Common Name	Scientific Name
Bass, white	*Morone chrysops*	Sunfish, green	*Lepomis cyanellus*
Bass, yellow	*Morone mississippiensis*	Sunfish, longear	*Lepomis megalotis*
Bluegill	*Lepomis macrochirus*	Sunfish, redear	*Lepomis microlophus*
Catfish, blue	*Ictalurus furcatus*	Trout, brown	*Salmo trutta*
Catfish, channel	*Ictalurus punctatus*	Trout, rainbow	*Oncorhynchus mykiss*
Catfish, flathead	*Pylodictis olivaris*	Walleye	*Stizostedion vitreum*
Crappie, black	*Pomoxis nigromaculatus*		
Source: AFS 2005			

In 2000, the largemouth bass virus (LMBV) was found for the first time in Oklahoma in Lake Tenkiller. LMBV has been found in other species, such as other bass and sunfish, but the virus is only fatal in largemouth bass (ODWC 2004b). Since the discovery of this virus in Oklahoma, ODWC has tested for LMBV in 26 other lakes. LMBV virus was found in 21 of the 26 lakes, including Tenkiller and Eucha lakes, both of which are in the ROI (ODWC 2004b).

3.1.2 Vegetation

3.1.2.1 Description

Vegetation includes native and introduced plant species. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.1.2.2 Affected Environment

By definition, ecoregions are areas of relatively uniform ecological systems that have similar vegetation, climate, and geology. A Roman numeral hierarchy is used to denote different levels of ecoregions (Woods et al. 2005). Level I Ecoregions are the broadest level and divide North America into 15 ecological regions. Level II Ecoregions divide North America into 52 ecological regions and Level III Ecoregions divide the continental U.S. into 104 ecological regions. Level IV Ecoregions are a further division of Level III Ecoregions. Within the hierarchy of ecoregions, each lower level is more specific in regards to vegetation, climate, and geology on a smaller scale. Level III and Level IV ecoregions are typically used to describe the ecological regions of individual States.

Oklahoma is divided into 12 Level III Ecoregions. Ecoregions within the ROI are the Arkansas Valley, Boston Mountains, and the Ozark Highlands. Level III Ecoregions are further subdivided into Level IV Ecoregions or, for the purposes of discussion in this analysis, *subregions* (Table 6, Figure 2). The potential natural vegetation of the subregions within the ROI as described by Woods et al. (2005) is discussed in the following subsections.

3.1.2.2.1 Arkansas Valley

The Tenkiller watershed contains portions of three different Level III Ecoregions, one of which is the Arkansas Valley ecoregion. The Tenkiller watershed lies within the Arkansas River Floodplain of this ecoregion. The Arkansas River Floodplain subregion is typified by floodplains and low terraces along the Arkansas River. Common features are those typical of floodplain areas, such as oxbow lakes, swamps, natural levees, scars, and swales. Vegetation includes deciduous forest species such as oak (*Quercus sp.*),

sycamore (*Platanus sp.*), sweetgum (*Liquidambar styraciflua*), willow (*Salix sp.*), cottonwood (*Populus deltoids*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis laevigata*), pecan (*Carya illinoinensis*), and elm (*Ulmus sp.*), with some understory grasses. Much of this subregion has been cleared for crop production.

Table 6. Level III and Level IV Ecoregions in the ROI.

Watershed	Level III Ecoregion	Level IV Ecoregion (Subregion)
Tenkiller	Arkansas Valley	Arkansas River Floodplain
	Boston Mountains	Lower Boston Mountains
	Ozark Highlands	Springfield Plateau, Dissected Springfield Plateau—Elk River Hills
Spavinaw	Ozark Highlands	Springfield Plateau, Dissected Springfield Plateau—Elk River Hills

Source: Woods et al. 2005

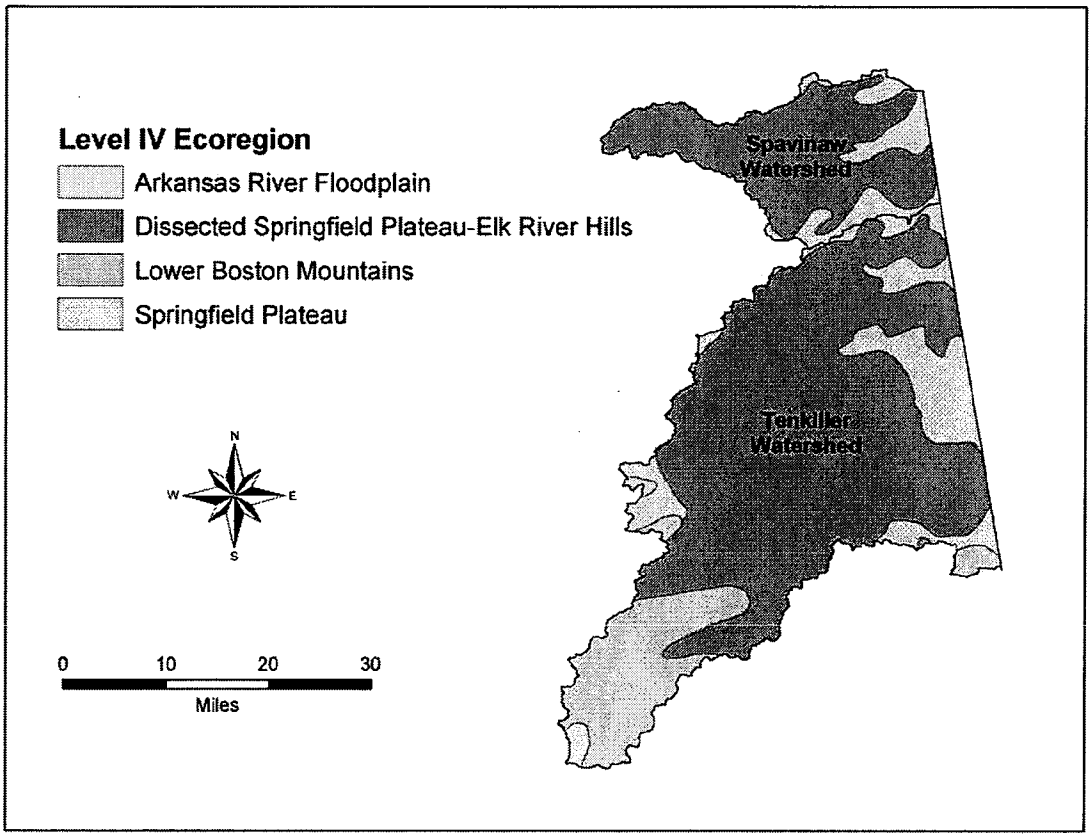

Figure 2. Level IV Ecoregions in the ROI.

3.1.2.2.2 Boston Mountains

The Tenkiller watershed is also within the Lower Boston Mountains of the Boston Mountains ecoregion. The Lower Boston Mountains subregion is characterized by rounded, high hills or low mountains, and benches. Vegetation in this subregion consists of mostly hardwood forests. Species within hardwood

forests may include blackjack oak (*Quercus marilandica*), post oak (*Quercus stellata*), black hickory (*Carya texana*), sugar maple (*Acer saccharinum*), white oak (*Quercus alba*), chinquapin oak (*Quercus muehlenbergii*), mockernut hickory (*Carya tomentosa*), birch (*Betula sp.*), sycamore (*Platanaceae sp.*), elms (*Ulmus sp.*), willows (*Salix sp.*), bitternut hickory (*Carya cordiformis*), and cottonwood (*Populus deltoides*).

3.1.2.2.3 Ozark Highlands

Both the Tenkiller and Spavinaw watersheds are located within two subregions of the Ozark Highlands ecoregion. These subregions are the Springfield Plateau and the Dissected Springfield Plateau—Elk River Hills. The Springfield Plateau subregion is characterized by level to rolling landscapes that are relatively undissected. Caves and sinkholes are common. Vegetation includes oak-hickory forests, mixed deciduous forests, and oak-hickory-pine forests. Historically, savannas and tall grass prairies were common and managed by fire. Current species within the Springfield Plateau may include black oak (*Quercus velutina*), white oak (*Quercus alba*), blackjack oak (*Quercus marilandica*), post oak (*Quercus stellata*), winged elm (*Ulmus alata*), hickories (*Carya sp.*), willow (*Salix sp.*), maple (*Acer sp.*), birch (*Betula sp.*), American elm (*Ulmus americana*), and sycamore (*Platanaceae sp.*). Primary land uses within this subregion are agriculture, including the growing of small grains, grapes, orchard fruit, or vegetables; construction of residential areas; and pastureland.

The Dissected Springfield Plateau—Elk River Hills subregion displays rolling landscapes similar to those of the Springfield Plateau subregion, but is moderately to highly dissected. Dissection is due to steep valleys and narrow ridgetops. Vegetation within the Dissected Springfield Plateau—Elk River Hills includes oak-hickory forests, oak-hickory-pine forests, mixed deciduous forests, mixed deciduous-pine forests, and bottomland deciduous forests. Species may include black oak (*Quercus velutina*), white oak (*Quercus alba*), blackjack oak (*Quercus marilandica*), hickories (*Carya sp.*), shortleaf pine (*Pinus echinata*), post oak (*Quercus stellata*), sugar maple (*Acer saccharinum),* northern red oak (*Quercus rubra*), American elm (*Ulmus americana*), and sycamore (*Plantanaceae sp.*). Primary land uses within this subregion are livestock and poultry farming, logging, grazing, and recreational activities.

3.1.3 Protected Species and Habitat

3.1.3.1 Description

Protected species are those terrestrial, avian, and aquatic species designated by FWS as threatened, endangered, or candidate species under the *Endangered Species Act of 1973*, as amended (16 USC 35 parts 1531 et seq., 1988). Critical habitats are specific geographic areas that are essential for conservation of a particular species and that have been formally designated by Federal rule.

The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3. There is no critical habitat in the immediate vicinity of the ROI.

3.1.3.2 Affected Environment

FWS lists 28 protected species in Oklahoma (Table 7) (FWS 2005). Four mammals, one insect, five birds, and three mussels are listed as endangered. One reptile, two mammals, five fish, two birds, and two plants are listed as threatened. One fish, one bird, and one mussel are candidate species for listing. In addition, ODWC lists three species that the State considers threatened or endangered, but are not federally listed (Table 7) (ODWC 2005c).

Table 7. Protected species in Oklahoma.

Species	Federal Status*	State Status*	Species	Federal Status*	State Status*
Alligator, American (*Alligator mississippiensis*)	T	T	Madtom, Neosho (*Noturus placidus*)	T	T
Bat, gray (*Myotis grisescens*)	E	E	Mapleleaf, winged (*Quadrula fragosa*)	E	---
Bat, Indiana (*Myotis sodalis*)	E	E	Mucket, Neosho (*Lampsilis rafinesqueana*)	C	E
Bat, Ozark big-eared (*Corynohinus townsendii ingens*)	E	E	Mussel, scaleshell (*Leptodea leptodon*)	E	E
Bear, grizzly (*Ursus arctos horribilis*)	T	---	Orchid, eastern prairie fringed (*Platanthera leucophaea*)	T	---
Beetle, American burying (*Nicrophorus americanus*)	E	E	Orchid, western prairie fringed (*Platanthera praeclara*)	T	---
Cavefish, Ozark (*Amblyopsis rosae*)	T	T	Plover, piping (*Charadrius melodus*)	T	T
Crane, whooping (*Grus americana*)	E	E	Pocketbook, Ouachita rock (*Arkansia wheeleri*)	E	E
Crayfish, cave (*Cambarus zophonastes*)	---	E	Prairie-chicken, lesser (*Tympanuchus pallidicinctus*)	C	---
Curlew, Eskimo (*Numenius borealis*)	E	---	Shiner, Arkansas river (*Notropis girardi*)	T	T
Darter, Arkansas (*Etheostoma cragini*)	C	---	Tern, least interior population (*Sterna antillarum*)	E	E
Darter, blackside (*Percina maculate*)	---	T	Trout, bull (*Salvelinus confluentus*)	T	---
Darter, leopard (*Percina pantherina*)	T	T	Vireo, black-capped (*Vireo atricapilla*)	E	E
Darter, longnose (*Percina nasuta*)	---	E	Wolf, gray (*Canis lupus*)	E	---
Eagle, bald (*Haliaeetus leucocephalus*)	T	T	Woodpecker, red-cockaded (*Picoides borealis*)	E	E
Lynx, Canada (*Lynx Canadensis*)	T	---			

**Status Codes: E = Endangered; T = Threatened; C = Candidate*
Source: FWS 2005, ODWC 2005c

Not all of the species listed by FWS occur within the ROI. Of the 28 federally-listed species, 10 have historically used or currently use habitat within or near the ROI (Table 8).

Table 8. Protected species in the ROI.

Common Name	Watersheds of Potential Occurrence
Bat, gray	Tenkiller, Spavinaw
Bat, Indiana	Tenkiller, Spavinaw
Bat, Ozark big-eared	Tenkiller, Spavinaw
Beetle, American burying	Tenkiller, Spavinaw
Cavefish, Ozark	Spavinaw
Darter, Arkansas	Tenkiller, Spavinaw
Eagle, bald	Tenkiller, Spavinaw
Mucket, Neosho	Tenkiller, Spavinaw
Plover, piping	Tenkiller, Spavinaw
Tern, least interior	Tenkiller
Source: Oklahoma Ecological Services (OES) 2005a	

Gray Bat

The gray bat was first listed as endangered on April 28, 1976. This species is presently thought to occur in Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Missouri, Oklahoma, Tennessee, Virginia, and West Virginia (41 FR 83, 1976). This species may occur within the Tenkiller and Spavinaw watersheds (Adair, Cherokee, and Delaware counties) (OES 2005a).

Gray bats are invertivores that roost in certain caves during different seasons. Caves have specific dimensions that will either keep the cave cold in the winter or warm in the summer, depending on the needs of this species. Most summer caves are located near rivers or streams where the gray bat will go to feed. The biggest factor affecting the decline of this species is human disturbance at roosting sites. Pesticides, such as those used in agricultural practices, may also be affecting the species.

Indiana Bat

The Indiana bat was first listed by FWS on March 11, 1967, and is currently considered endangered throughout its entire range. The species is presently thought to occur in Alabama, Arkansas, Georgia, Iowa, Illinois, Indiana, Kansas, Kentucky, Maryland, Michigan, Missouri, Mississippi, North Carolina, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia, Vermont, and West Virginia (32 FR 4001, 1967). This species may occur within the Tenkiller and Spavinaw watersheds (Adair, Delaware, and Mayes counties) (OES 2005a).

Indiana bats primarily roost in caves which are selected by the dimensions of the cave. In winter, the Indiana bat chooses caves that will provide stable, cold temperatures in order to allow them to retain fat supplies and expend less energy (FWS 1983). There is less known about summer requirements; however, maternity habitat seems focused around riparian areas and floodplains of smaller waterbodies. Riparian areas with mature trees that overhang waterways provide suitable foraging habitat, as Indiana bats appear to forage more on aquatic insects then terrestrial ones (FWS 1983).

Ozark Big-Eared Bat

The Ozark big-eared bat was listed as endangered throughout its entire range on November 30, 1979. This species is presently thought to occur in Arkansas, Missouri, and Oklahoma (44 FR 232, 1979). These bats

may occur within the Tenkiller and Spavinaw watersheds (Adair, Cherokee, Delaware, and Sequoyah counties) (OES 2005a).

The Ozark big-eared bat feeds primarily on moths and forages mostly in edge habitats, between open areas and forested habitat (FWS 1995). This species utilizes cliffs, caves, and rock ledges; often set in well-drained Ozark forests.

American Burying Beetle

The American burying beetle was first listed as endangered on July 13, 1989. This species is thought to occur in Arkansas, Massachusetts, Michigan, Nebraska, Ohio, Oklahoma, Rhode Island, South Dakota, and areas in Canada (54 FR 133, 1989). There have been confirmed occurrences of American burying beetles in the Tenkiller watershed (Cherokee and Sequoyah counties), and unconfirmed occurrences in the Spavinaw watershed (Adair and Delaware counties) (OES 2005a). Unconfirmed occurrences are those instances in which the species has been sighted by a reliable source, but not an FWS biologist or entomologist (OES 2005a).

American burying beetles require carrion to persist. These beetles will bury carrion underground and then lay eggs on the carrion. They stay in the same location to rear their young. Current habitat types include areas of coastal moraine grasslands, pastureland, and shrub thickets. Although it is generally agreed upon that suitable top soil and humus to bury decaying carrion is a habitat requirement, it is not known what makes the components suitable. The availability of carrion is a more important limiting factor to the American burying beetle than other habitat requirements.

Ozark Cavefish

Ozark cavefish were initially listed on November 1, 1984, and are currently considered as threatened throughout their entire range (49 FR 213, 1984). They are presently known to occur in Arkansas, Missouri, and Oklahoma. Ozark cavefish may occur within the Spavinaw watershed (Mayes County) (OES 2005a).

Ozark cavefish occupy cave streams that have pool areas. Because cave streams have limited access to sunlight, energy supply for the streams comes from other sources, such as leaf debris or bat guano (FWS 1988). Most cavefish-occupied cave streams are fed from underground aquifers rather than by surface water supply. Ozark cavefish have low metabolic requirements and have adapted to the low dissolved oxygen content found in cave streams. Areas that Ozark cavefish inhabit are usually of high water quality. Human disturbance, over-collecting, water pollution, and a low reproductive rate are the major contributors to the decline of this species (FWS 1988).

Arkansas Darter

The Arkansas darter is currently listed as a candidate species for the Federal threatened and endangered species list. The darter is known to occur only in Arkansas, Colorado, Kansas, Missouri, and Oklahoma (FWS 2004a). This species may occur within the Tenkiller and Spavinaw watersheds (Cherokee, Delaware, and Mayes counties) (OES 2005a).

Arkansas darter habitat includes areas of pebble or sand bottom pools in small streams and marshes. Streams are often spring fed and contain cool water and aquatic vegetation (FWS 2004a). Water depletion from agricultural and municipal development is the one of the biggest factors inhibiting survival of this species. Arkansas darters are poor competitors that do not thrive in habitats with great fish diversity (FWS 2004a).

Bald Eagle

FWS first listed bald eagles as endangered in 1967 but, after great conservation efforts, reclassified the species to threatened on July 12, 1995 (60 FR 133, 1995). Bald eagles are currently known to occur in all of the lower 48 States (60 FR 133, 1995). This species may occur within the Tenkiller and Spavinaw watersheds (Adair, Cherokee, Delaware, Mayes, and Sequoyah counties) (OES 2005a).

Bald eagle habitat is primarily focused around aquatic ecosystems that provide a substantial food base (60 FR 133, 1995). Aside from food base, habitat selection for the bald eagle is based on the availability of perching areas and sufficient nesting areas.

Neosho Mucket

Neosho muckets, currently listed as a candidate species for the Federal threatened and endangered species list, are known to occur in Arkansas, Kansas, Oklahoma, and Missouri (FWS 2004b). They may occur within the Tenkiller and Spavinaw watersheds (Adair, Cherokee, and Delaware counties) (OES 2005a).

Neosho mucket habitat includes waterways with stable runs, riffles with gravelly bottoms, shoals, and moderate currents (FWS 2004b). Detailed habitat and ecology information for this species is limited. Young Neosho mucket larvae are obligate parasites and will attach to fish for hosts. In Oklahoma, a population of Neosho muckets was found along a stretch of the Illinois River, from Okalahoma to the Arkansas State line down to the headwaters of Tenkiller Lake (FWS 2004b). Little evidence of recruitment was found within the Illinois River population. Loss of habitat due to dams, sedimentation, and agricultural pollution is the largest limiting factor affecting Neosho mucket populations (FWS 2004b). In the past, commercial over-harvesting for the pearl button industry decreased Neosho mucket populations (FWS 2004b).

Piping Plover

Piping plovers were listed as threatened on December 12, 1985 (FWS 1996). They are still listed as threatened, except in the Great Lakes watershed, where they are listed as endangered. Within the U.S., the piping plover is known to occur in Alabama, Colorado, Connecticut, Delaware, Florida, Georgia, Iowa, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Maryland, Maine, Minnesota, Missouri, Mississippi, Montana, North Carolina, North Dakota, Nebraska, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Rhode Island, South Carolina, South Dakota, Texas, Virginia, and Wisconsin. Piping plovers may occur within the Tenkiller and Spavinaw watersheds (Cherokee, Delaware, Mayes, and Sequoyah counties) (OES 2005a).

Piping plovers migrate through Oklahoma in the spring and fall. This species utilizes sandy beaches, usually along lakes or oceans, for nesting. When nesting around rivers, piping plover habitat consists of bare sandbars and islands. The number one reason for population decline is the loss and modification of habitat.

Least Interior Tern

The least interior tern, first listed by FWS on May 28, 1985, is currently designated as endangered throughout its range (50 FR 102, 1985). Least interior terns are known to occur in Arkansas, Colorado, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Missouri, Mississippi, Montana, North Dakota, Nebraska, New Mexico, Oklahoma, South Dakota, Tennessee, and Texas (50 FR 102, 1985). This species may occur in the Tenkiller watershed (Sequoyah County) (OES 2005a).

Least interior tern habitat is fairly consistent throughout their range. Nesting areas include riverine areas that are sparsely vegetated, salt flats along river shorelines, and gravel bars located within unobstructed river channels (50 FR 102, 1985). Habitat selection is based on the presence of sparsely vegetated alluvial

islands, favorable water levels during nesting, and the availability of food. In Oklahoma, least interior terns have been found nesting on barren flats within saline lakes and ponds (50 FR 102, 1985). Loss of habitat and insufficient formation of new habitat is the most limiting factor to their persistence. Construction of dams and reservoirs disrupts natural erosion processes and eliminates the formation of islands. Human disturbance in nesting habitat has also been found to be a significant limiting factor to the interior least tern (50 FR 102, 1985).

3.2 Cultural Resources

3.2.1 Archaeological Resources

3.2.1.1 Description

Archaeological resources are locations and objects from past human activities. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.2.1.2 Affected Environment

The rich cultural history of Oklahoma is illustrated by the numerous archaeological sites throughout the State. There are presently 18,219 archaeological sites in Oklahoma, 450 of which occur within or near the ROI (Table 9) (National Register of Historic Places [NRHP] 2006).

3.2.1.2.1 Prehistoric Periods (12,000–500 years present [BP])

The study of paleoecological, ethnographic, historic, and archaeological work within Oklahoma and the surrounding areas has resulted in a better understanding of the past 12,000 years of human occupation and culture within the region. It is useful to organize this information into cultural periods based on time, diagnostic artifacts or artifact assemblages from the archaeological record, and the environmental conditions that affected human adaptation to the landscape. The following is a generalized summary of the highlights of the cultures of what is now the State of Oklahoma (Oklahoma Archeological Survey [OAS] 2006).

PaleoIndian Period (12,000–8,000 years BP)

The people of this period were mobile hunters of large mammals, such as mammoth and giant bison, that are now extinct. Archaeological cultures from this period include Clovis, Folsom, and Dalton, among others. These cultures were defined on the basis of their signature stone spear points and tool assemblages.

Archaic Period (8,000–2,000 years BP)

Hunters were gradually becoming less mobile during this period. The early Archaic period people were probably as nomadic as their PaleoIndian ancestors, with later Archaic people inhabiting more permanent camps. During the early Archaic period, spear points similar to that of the PaleoIndian period were still used. However, the giant bison of the PaleoIndian period was probably already extinct going into the early Archaic period. The people of the late Archaic period had begun using bows and arrows rather than spears, and were also using rock ovens and grinding stones to grind plant food in their semi-permanent camps. During this period, the climate was much like it is today in Oklahoma.

Woodland Period (2,000–1,200 years BP)

The Woodland period is a time of transition in American Indian cultures. In this period, pottery was introduced and bows and arrows almost entirely replaced spears. The lifestyle of the Woodland period was more sedentary; people would move camp when local resources were depleted. The first sign of plant

domestication is evidenced during the Woodland period. Native plants and grasses were probably tended and harvested.

Villager Period (1,200 –500 years BP)

The people of the Villager period lived mainly in permanent villages on fertile stream valley soils. Hunting was predominately for bison and deer, with fish and mussels being important dietary additions. Farming villages harvested foods such as corn, beans, and squash, along with tobacco. During this time, the people of what is now eastern Oklahoma composed a highly-ranked religious society that was supported by farming. The people who inhabited what is now western Oklahoma were farmers that built concentrated villages along the Washita River and its tributaries. Aside from farming, bison was another primary food source and the villages used the entire animal for food, tools, and clothing.

3.2.1.2.2 Protohistoric and Historic Periods (500 years BP–Present)

The protohistoric period in what is now considered Oklahoma was marked by European contact with the American Indians. With this contact, weighty changes occurred to the American Indian culture. Spanish horses were introduced and became a major part of the culture, along with formerly unknown disease.

Oklahoma was not as impacted by foreign born settlers as other States were due to the manner in which the land was opened to settlement. Land was distributed by lotteries, which made it difficult for extended families to find plots together (Baxter 1986). Early historic settlement by western and northern European immigrants began in the late 18th and early 19th centuries.

European settlement of the ROI portion of Oklahoma occurred around this same time period and was predominantly by Czechs, Germans, Poles, and Mennonites from Russia (Baxter 1986). Not all settlers were interested in farming, and many took to other occupations such as railroad work, coal mining, oil industry work, and ore smelting.

Table 9. Archeological sites within the ROI.

County	Watershed	Number of Archaeological Sites by Prehistoric Period
Adair	Tenkiller	PaleoIndian (2), Archaic (30), Woodland (9), Villager (9)
Cherokee	Tenkiller	PaleoIndian (2), Archaic (69), Woodland (19), Villager (23)
Delaware	Tenkiller, Spavinaw	PaleoIndian (0), Archaic (23), Woodland (17), Villager (63)
Mayes	Spavinaw	PaleoIndian (1), Archaic (35), Woodland (25), Villager (31)
Sequoyah	Tenkiller	PaleoIndian (1), Archaic (41), Woodland (15), Villager (35)
Source: OAS 2006		

3.2.2 Architectural Resources

3.2.2.1 Description

Architectural resources are standing structures that are usually over 50 years of age and of significant historic or aesthetic value. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.2.2.2 Affected Environment

Architectural resources in Oklahoma include structures such as schools, mills, homesteads, hotels, seminaries, libraries, armories, and churches. Architectural properties in Oklahoma are mostly focused

around the lifestyles and cultures of Euro-American exploration, American Indian culture, railroad construction, oil industry, and mining towns. There are 18 architectural sites within the ROI that are listed in NRHP (Table 10) (Oklahoma State Historic Preservation Office [OSHPO] 2005a).

Table 10. Properties within the ROI listed in NRHP.

County	Watershed	Number of Properties	NRHP Property and Location
Adair	Tenkiller	4	Stilwell: Adair County Courthouse, Golda's Mill Westville: Buffington Hotel, Opera Block
Cherokee	Tenkiller	14	Park Hill: Murrel Home Tahlequah: Alston-Bedwell House, Cherokee Female Seminary, Cherokee National Capitol, Cherokee National Jail, Cherokee Supreme Court Building, Dr. Irwin D. Loeser Log Cabin, First Cherokee Female Seminary Site, French-Parks House, Indian University of Tahlequah, Joseph M. Thompson House, Leonard M. Logan House, Tahlequah Armory, Tahlequah Carnegie Library
Source: OSHPO 2005a			

3.2.3 Traditional Cultural Properties

3.2.3.1 Description

Traditional cultural properties (TCPs) hold importance to American Indians or other ethnic groups for the continuing practice of traditional culture. Any of these properties may meet the criteria for inclusion in the NRHP and this determination of eligibility (36 CFR 8 parts 800.3–800.13, 2005) is a requirement of Federal and State environmental assessment processes before the initiation of ground disturbance or alteration of a landscape or structure. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.2.3.2 Affected Environment

There are four TCPs within the ROI that are recognized by NRHP (Table 11). The grave of Reverend Jesse Bushyhead, a significant religious and political leader of the Cherokee Nation, was listed in 2004. Ross Cemetery, listed in 2002, is the burial place of Chief John Ross, who was a principal Chief of the Cherokee Nation during the Civil War. The Illinois Campground was listed in 2004 and designates the point on the Trail of Tears at which Chief Ross disbanded his detachment. The Polson Cemetery, located near the town of Jay, was listed in 1977 because it contains the stone marker of Confederate General Stand Watie.

Table 11. TCPs within the ROI.

County	Watershed	Number of Properties	Traditional Cultural Properties
Adair	Tenkiller	1	Westville: Reverend Jesse Bushyhead Grave
Cherokee	Tenkiller	2	Park Hill: Ross Cemetery Tahlequah: Illinois Campground
Delaware	Spavinaw	1	Jay: Polson Cemetery
Source: OSHPO 2005a			

3.3 Water Resources

3.3.1 Surface Water

3.3.1.1 Description

Surface water includes rivers, streams, and lakes, including those designated as impaired. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.1.2 Affected Environment

Section 303(d) of the *Clean Water Act* establishes water quality standards and every two years States must compile a list of waterbodies within their jurisdiction that do not meet these standards (33 USC 26 parts 1251 et seq., 2000). These lists, which identify the impairments to each waterbody, are commonly known as *303(d) lists*. Once the list is complete, each jurisdiction must then determine priority rankings for these waters and establish total maximum daily loads (TMDLs) for each. A TMDL is the maximum amount of pollutants a waterway can receive daily and still meet water quality standards (EPA 2005b). Impairments to waterways within the ROI include the presence of phosphorus and nitrates, low dissolved oxygen content, pathogens, and high levels of turbidity (Table 12). A listing of all waterbodies within the ROI is provided in Appendix E.

The number one cause of water impairments within the ROI is excessive nutrient loading (EPA 2002a). This is due in large part to the practice of fertilizing grazing land by applying poultry litter. Within the Tenkiller watershed, Baron (Barren) Fork, Caney Creek, Flint Creek, Illinois River, and Tenkiller Ferry Lake are listed as impaired due to an excess of phosphorus, and Sager Creek is impaired due to excess nitrates (Table 12). Lake Eucha and Spavinaw Lake in the Spavinaw watershed are also impaired due to high levels of phosphorus (Table 12) (EPA 2002a). The loading of nutrients can instigate eutrophication, which causes waterways to age in succession prematurely and triggers excess plant growth, such as algae blooms and aquatic weeds. Algae blooms occur naturally but with more frequency and severity in the presence of nutrients (NRCS 1994). When the algae die, they sink to the bottom of the waterway which often stimulates an increase in bacteria and other decomposers. As these decomposers increase in numbers, they deplete the dissolved oxygen supply within the waterway (NRCS 1994). Sometimes the respiration from the algae growth creates enough oxygen to offset the use of the oxygen by the decomposers. If there is not a balance, eutrophication can occur. An excess of nutrients can contribute to a variety of other water quality issues, such as decreased water clarity, fish kills, and a bad taste and odor to the water (NRCS 1994).

Table 12. Surface water impairments in the ROI.

Watershed	Waterbody	Impairment	Priority
Tenkiller	Baron (Barren) Fork	Phosphorus, pathogens	High
	Caney Creek	Phosphorus, turbidity	High
	Chicken Creek	Unspecified*	High
	Flint Creek	Phosphorus, pathogens	High
	Illinois River	Phosphorus, pathogens, turbidity	High
	Sager Creek	Nitrates, pathogens	High
	Stillwater City Lake	Low dissolved oxygen content	High
	Tahlequah Creek, Town Branch	Pathogens	High
	Tenkiller Ferry Lake	Phosphorus, low dissolved oxygen content	High
Spavinaw	Beaty Creek	Pathogens	High
	Lake Eucha	Phosphorus, low dissolved oxygen content	High
	Spavinaw Lake	Phosphorus, low dissolved oxygen content	High

**The water quality standard for warm water aquatic community beneficial use is not attained. Chicken Creek is impaired by an unspecified pollutant(s) and requires a TMDL. Establishment of TMDL(s) is scheduled for 2009 (Oklahoma Department of Environmental Quality [ODEQ] 2002a).*

Source: EPA 2002a

Dissolved oxygen is necessary for fish and other aquatic species to live. Stillwater City Lake and Tenkiller Ferry Lake in the Tenkiller watershed are listed as impaired due to low dissolved oxygen content (Table 12). Within the Spavinaw watershed, Lake Eucha and Spavinaw Lake are impaired due to low dissolved oxygen (Table 12) (EPA 2002a). Dissolved oxygen content can be altered by any number of factors such as volume, velocity, temperature, altitude, aquatic species present, vegetation, nutrient loading, and total dissolved solids within the waterway (EPA 1997). Low dissolved oxygen levels within the ROI may occur from the fast growth of vegetation and nutrient loading that result from organic pollution (e.g., poultry litter). When high levels of vegetation and other organic matter is introduced to the waterway, it increases the number of decomposers. The increased populations of decomposers require more oxygen than what was previously needed, thus the dissolved oxygen in the water decreases (EPA 1997). Fluctuating dissolved oxygen levels may cause some aquatic species to die or leave their current habitat.

Pathogens can enter waterways through numerous sources such as untreated sewage and livestock feces. Within the Tenkiller watershed, Baron Fork, Flint Creek, Illinois River, Sager Creek, and Tahlequah Creek are listed as impaired due to the presence of pathogens (Table 12). Beaty Creek in the Spavinaw watershed is also listed as impaired due to pathogens (Table 12) (EPA 2002a). The presence of pathogens may include bacteria, protozoa, viruses, and helminthes (i.e., parasitic worms) (EPA 2002b). Bacteria pathogens have been linked to typhoid fever and cholera. Protozoan pathogens have been linked to *Giardia lamblia* and *Cryptosporidium parvum* (EPA 2002b). Viruses are the cause of Hepatitis A and polio. All forms of pathogens can be infectious to those drinking, swimming, or handling pathogen-polluted waters. Surface water is usually tested for the presence of bacteria that indicate the presence of

human or animal waste. These water quality indicators include bacteria such as fecal coliforms, total coliforms, and *Escherichia coli* (EPA 2002b).

Turbidity is a measure of water clarity, which is affected by the presence of sediments suspended in the water column (EPA 1997). In the Tenkiller watershed, Caney Creek and the Illinois River are listed as impaired due to high turbidity (Table 12) (EPA 2002a). Waterways with heavy suspended sedimentation loads have lower dissolved oxygen contents because the suspended particles reduce light penetration, affecting photosynthesis. Water temperature is warmer in waters with high turbidity because the suspended particles absorb heat; warmer water also lowers dissolved oxygen content (EPA 1997). Turbidity can affect aquatic species reproduction when sediments smother eggs and larvae on slow moving stream or river bottoms. High turbidity can be a result of events such as soil erosion, excessive algae growth, and waste discharge (EPA 1997).

3.3.2 Groundwater

3.3.2.1 Description

Groundwater refers to subsurface hydrologic resources such as aquifers that are used for domestic, agricultural, and industrial purposes. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.2.2 Affected Environment

The Tenkiller and Spavinaw watersheds are within the Oklahoma Water Resources Board (OWRB) Northeast Planning Region (OWRB 1995). Two of the four major groundwater basins within this region are in the Tenkiller and Spavinaw watersheds. One, the Roubidoux aquifer, is a fractured dolomite aquifer that yields 150–600 gallons per minute (gpm) of moderately hard water (OWRB 1995). The other, the Keokuk-Reed Springs aquifer, is formed of residual chert, clay, and cherty limestone. Surface springs within this aquifer can yield 600–3,500 gpm, while wells from the formation yield on average 1–10 gpm (OWRB 1995).

3.3.3 Wetlands

3.3.3.1 Description

Wetlands are defined by the U.S. Army Corps of Engineers (USACE) as areas that are characterized by a prevalence of vegetation adapted to saturated soil conditions. Wetlands can be associated with surface water or groundwater and are identified based on specific soil, hydrology, and vegetation. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.3.2 Affected Environment

The 1987 USACE Wetland Delineation Manual (USACE 1987) provides guidelines to identify and delineate wetlands. For regulatory purposes under the *Clean Water Act*, wetlands are defined as:

> "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." (33 CFR 3 part 328.3, 2005)

At one time Oklahoma landscapes held roughly 2,842,600 acres of wetlands, approximately 67 percent more then the current acreage (Association of State Wetland Managers [ASWM] 2004). Most wetland

areas have been converted to agricultural croplands or have been degraded due to channelization, streamflow regulation, and impoundments. Only 949,700 acres of wetlands remained in Oklahoma as of 2004 (ASWM 2004). Most wetlands within Oklahoma are palustrine wetlands and comprised of bottomland-hardwoods, marshes, and wet meadows (ASWM 2004). Wetlands may occur within the ROI.

3.3.4 Floodplains

3.3.4.1 Description

In this analysis, floodplains are defined as 100-year floodplains, designated by the Federal Emergency Management Agency (FEMA) as those low-lying areas that are subject to inundation by a 100-year flood (i.e., a flood that has a 1 percent chance of being equaled or exceeded in any given year). The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.3.4.2 Affected Environment

In general, a floodplain can be defined as a flat area, located adjacent to a stream channel that provides natural storage for water overflow during or after a storm event. EO 11988, *Floodplain Management*, requires that Federal agencies:

> "...take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains..." (42 FR 26951, 1979)

As the Oklahoma CREP agreement would intend to enroll riparian lands, it is expected that some of the eligible land would be located within floodplains. However, the type of floodplain (e.g., 100-year floodplain) cannot be determined without an exact site location and a FEMA floodplain map. Site specific evaluations would be conducted prior to enrolling a site into CREP to determine if the site is within, or would impact, a 100-year floodplain.

3.4 Soil Resources

3.4.1 Description

For the purposes of this analysis, soil resources are topography, soil, and paleontological resources. The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.4.2 Affected Environment

3.4.2.1 Topography

The three major physiographic regions in Oklahoma are the Atlantic Plain, the Interior Plains, and the Interior Highlands (National Park Service 2000, Ryder 1996). The Atlantic Plain lies along the southeastern edge of the State and is the flattest of the provinces. The Interior Plains account for the largest area of Oklahoma. This province also appears relatively flat, but actually slopes gently to the east.

The ROI lies within the Interior Highlands, which lie along the eastern portion of the State. This region is divided into two provinces that display similar landform characteristics. The Ozark Plateau to the north is characterized by broad, flat-topped hills and narrow river valleys. The Ouachita province to the south consists of the Arkansas River Valley and the Ouachita Mountains, a series of steeply folded ridges and

valleys. The Tenkiller and Spavinaw watersheds are located primarily within the Ozark Plateau, with the southern portion of the Tenkiller watershed reaching into the Ouachita province (Figure 3).

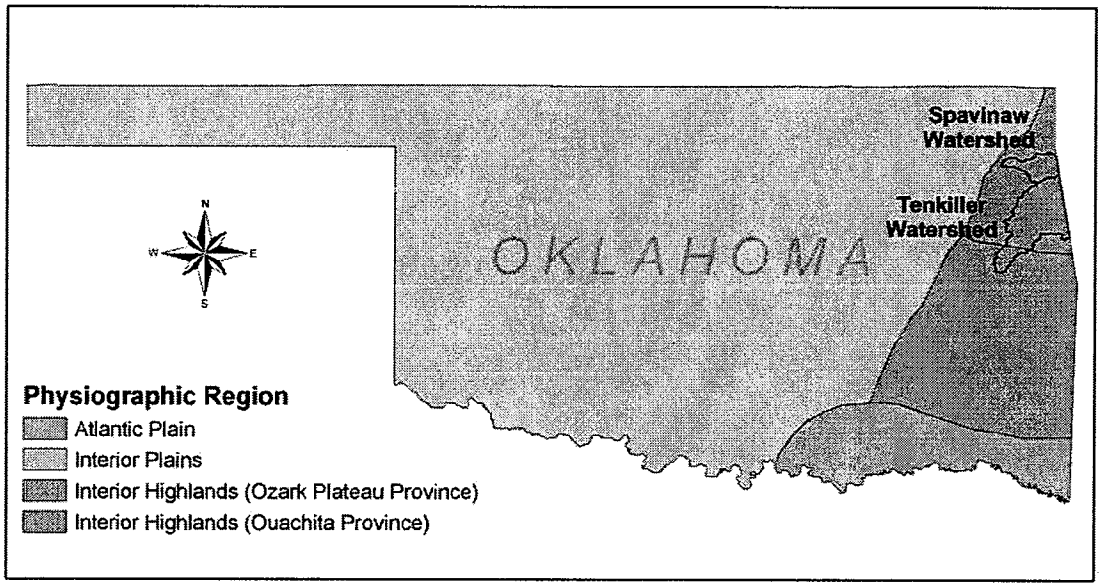

Figure 3. Physiographic provinces of Oklahoma (modified from Ryder 1996).

3.4.2.2 Soil

For this analysis, soils are described by Level IV Ecoregion (Woods et al. 2005, University of Idaho 2006) (Figure 2, Table 13). Soils in the ROI include mollisols, entisols, inceptisols, vertisols, alfisols, and ultisols. Mollisols are the typical soils of grassland ecosystems and are characterized by a thick, dark surface horizon. They are rich in organic materials and thus very productive agriculturally. Mollisols are common to every ecoregion within the ROI.

Entisols are very diverse and are developed in unconsolidated parent material. They usually lack genetic horizons except an A horizon. Ecoregions that contain entisols include the Arkansas River Floodplain and the Dissected Springfield Plateau-Elk River Hills.

Inceptisols exhibit minimal horizon development and can occur in a wide range of ecological settings. This soil type is found in the Arkansas River Floodplain and Lower Boston Mountains.

Vertisols are clay-rich soils that shrink and swell with changes in moisture content, and thus tend to lack distinct, well-developed horizons. Vertisols are found in the ROI only within the Arkansas River Floodplain.

Alfisols are relatively fertile and tend to be very productive for both agriculture and silviculture. Ecoregions with these soil types are the Dissected Springfield Plateau-Elk River Hills and the Springfield Plateau.

Ultisols are strongly leached and acidic soils with relatively low native fertility. Clays accumulate in the subsurface horizon and soils often display a strong yellowish or reddish color resulting from the presence

of iron oxides. These soils are found in the Dissected Springfield Plateau-Elk River Hills, Lower Boston Mountains, and the Springfield Plateau.

Table 13. Common soils in the Level IV Ecoregions of the ROI.

Level IV Ecoregion	Watershed	Order	Common Soil Series
Arkansas River Floodplain	Tenkiller	Mollisols, Entisols, Inceptisols, and Vertisols	Severn, Moreland, Coushatta, Choska, Kiomatia, Oklared, and Roebuck
Dissected Springfield Plateau-Elk River Hills	Tenkiller, Spavinaw	Ultisols and Alfisols on hillsides, ridgetops, and dissected uplands; Entisols, Alfisols, and Mollisols on floodplains and low terraces	Bodine, Baxter, Clarksville, Etowah, Sallisaw, Elsah, Staser, and Huntington
Lower Boston Mountains	Tenkiller	Ultisols and Inceptisols on uplands; Inceptisols and Mollisols on floodplains and low terraces	Hector, Linker, Nella, Enders, Mountainburg, Steprock, Rosebloom, Mason, Huntington, and Ennis
Springfield Plateau	Tenkiller, Spavinaw	Ultisols, Alfisols, and Mollisols on uplands; Mollisols on floodplains and low terraces	Bodine, Baxter, Eldorado, Craig, Jay, Captina, Etowah, and Huntington

Source: Woods et al. 2005

3.4.2.3 Paleontological Resources

Paleontological resources are closely associated to geologic settings. Geological settings can be used to predict the occurrence of fossils, their type, abundance, and quality of preservation. As described by USGS (2004), the Interior Highlands of Oklahoma are ancient, eroded mountains composed of carbonate and other sedimentary rocks that were originally deposited on the sea floor and eventually contorted by folds and faults.

Oklahoma geologic strata yield plant, invertebrate, vertebrate, and trace fossils from the relatively recent Pleistocene Epoch (10,000 years to 1.6 million BP) back through the Cambrian Period (505–570 million years BP). Vertebrate fossils include those from fish, amphibians, reptiles, dinosaurs, birds, and mammals (Bureau of Land Management 2005).

Paleontological resources may be considered part of the national natural, scientific, and educational heritage. There is currently no unified Federal policy regarding the treatment of paleontological resources outside of an archaeological context; however, various historic, cultural, or natural resource preservation statutes may apply to fossil resources on State and Federal lands.

3.5 Air

3.5.1 Description

Although the *Clean Air Act* (42 USC 85 parts 7401 et seq., 1999) is a Federal law, States are generally responsible for implementing the Act. Each State is required by EPA to develop a State Implementation Plan that contains strategies to achieve and maintain National Ambient Air Quality Standards (NAAQS). NAAQS establish limits for six criteria pollutants including ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, lead, and respirable particulates (particulate matter less than 10 microns in diameter).

Areas that violate air quality standards are designated as non-attainment areas for the relevant pollutants. Areas that comply with air quality standards are designated as attainment areas for relevant pollutants.

The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.5.2 Affected Environment

The ODEQ air quality division is responsible for ensuring that the air quality in Oklahoma meets or exceeds the levels required by Federal and State standards. To ensure Oklahoma is meeting NAAQS, ODEQ operates an air quality network. This network monitors ambient air quality with 62 monitors at 37 sites throughout the State (ODEQ 2003). There are no air quality monitors within the ROI.

Oklahoma has relatively clean air and meets all State and Federal ambient air quality standards. There are no non-attainment areas within the ROI or the State (EPA 2006b).

3.6 Recreation

3.6.1 Description

Recreational resources are those activities or settings, either natural or anthropogenic, designated or available for recreational use by the public. In this analysis, recreational resources include lands and waters used by the public for hunting, fishing, wildlife viewing, hiking, canoeing, and other water-related activities. The ROI for this resource includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.6.2 Affected Environment

Lands that could be enrolled in CREP are privately held; therefore, access to these lands is and would be controlled by the landowners. Public lands available for recreation within the ROI includes nine State parks, three wildlife management areas (WMAs), and two game management areas (GMAs). A WMA is land owned, licensed, leased, or under the management of ODWC (ODWC 2005b). WMAs are managed based on certain objectives such as game management, public hunting, waterfowl refuge, wetland development, or migratory bird refuge. GMAs are very similar in function to WMAs, but hunting and public uses in these areas are more strictly regulated (ODWC 2005b).

Portions of the 15,469-acre Cookson WMA, the 31,360-acre Cherokee GMA, the 2,590-acre Tenkiller WMA, and the 566-acre Sparrowhawk WMA lie within the Tenkiller watershed (ODWC 2005d). The 14,316-acre Spavinaw GMA lies within the Spavinaw watershed (ODWC 2005d). All WMAs and GMAs offer some hunting, fishing, boating, camping, hiking, and wildlife viewing opportunities to the public. Hunting and fishing, regardless of whether the land is public or private, requires an Oklahoma State license. A discussion of the economics associated with hunting, fishing, and other recreational activities is provided in Sections 3.7 and 4.7.

There is one national wildlife refuge (NWR), the Ozark Plateau NWR, within the Tenkiller watershed portion of the ROI. However, to protect fragile bat habitat, this NWR is not open to the public.

3.7 Socioeconomics

3.7.1 Description

Socioeconomic analyses generally include investigations of population, income, employment, and housing conditions of a specific area. Socioeconomic issues that are significant and considered in detail in

this analysis are non-farm and farm employment and income, farm production expenses and returns, agricultural land use, and recreation spending in the ROI. The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.7.2 Affected Environment

The total population within the ROI was 177,977 people in 2000, which was a 20.5 percent increase from the population of 1990 (USCB 1990a, 2000b). Approximately 26.5 percent of the total population was located in urban areas, and 73.5 percent of the population was located within rural areas (USCB 2000c). This was an increase of 2.4 percent from the 1990 urban population (USCB 1990b).

3.7.2.1.1 Non-Farm Employment and Income

Between 1993 and 2002, the non-farm labor force within the ROI ranged from 71,261 in 1993 to 80,341 in 2002 (Bureau of Labor Statistics [BLS] 2005). Non-farm employment also ranged during this period from a low of 66,227 positions in 1993 to a high of 76,488 positions in 2001 (BLS 2005). The unemployment rate within the ROI varied from a high of 3.8 percent in 1993 to a low of 2.0 percent in 2000 (BLS 2005). Within the ROI, Sequoyah County has experienced the highest average non-farm unemployment rate for the period (6.9 percent), with the highest rate occurring in 1998 (9.1 percent) (BLS 2005).

Median household income in 1999 ranged significantly within the ROI. The highest median household income in the ROI was $31,125 in Mayes County, and the lowest median household income was $24,881 in Adair County (USCB 2000b).

3.7.2.1.2 Farm Employment and Income

As reported by the *2002 Census of Agriculture* (USDA 2004), there were 4,769 farm workers on 1,298 worked farms within the ROI in 2002, accounting for a payroll of $28.1 million. Table 14 lists the hired farm and contract labor costs per county within the ROI and labor costs as a percentage of total production costs. In 1997, the total hired farm and contract labor costs were $23.3 million, which was 8.4 percent of total production costs. In 2002, the total hired farm and contract labor costs were $30.5 million, which was 10.6 percent of total production costs.

Approximately three-fourths of farm cash receipts in Oklahoma are from livestock and livestock products, while crops account for the remaining one-fourth (USDA 2003). Oklahoma ranked third in the U.S. for both cattle production and winter wheat in 2002 (USDA 2003). The Bureau of Economic Analysis (BEA) (2005) reported a realized net farm income in excess of $116 million within the ROI in 2002. This was a decrease of 45.3 percent as compared to the 1992 net farm income. BEA (2005) also reported that total government payments to farms within the ROI exceeded $6.5 million in 2002, an increase of 400 percent from 1992. Farm wages and perquisites in 2002 in the ROI were approximately $22.9 million, which was a 4.3 decrease from those in 1992. These costs were a significant contributor to the 48.0 percent reduction in net farm proprietors' income within the ROI from 1992.

Table 14. Hired farm and contract labor as a percentage of total production expenses for 1997 and 2002.

Area	2002				1997			
	Hired Farm Labor ($1,000)	Contract Labor ($1,000)	Total Production Expenses ($1,000)	Labor as a Percent of Total Production Expenses	Hired Farm Labor ($1,000)*	Contract Labor ($1,000)*	Total Production Expenses ($1,000)*	Labor as a Percent of Total Production Expenses
Oklahoma	237,162	38,838	4,069,112	6.8	191,754	29,679	3,784,514	5.9
Adair	1,760	460	62,595	3.5	1,686	404	62,186	3.4
Cherokee	20,333	355	63,871	32.4	14,933	322	55,998	27.2
Delaware	3,448	545	97,845	4.1	2,215	316	87,065	2.9
Mayes	1,240	408	41,486	4.0	1,287	148	30,217	4.7
Sequoyah	1,318	602	21,681	8.9	1,244	742	40,284	4.9

**Value in 2002 dollars*
Source: USDA 2004

3.7.2.1.3 Farm Production Expenses and Returns

In 2002, farm production expenses exceeded $287 million within the ROI. This was a decrease over the 1992 figure of $325 million (adjusted to 2002 dollars) (USDA 2004, BEA 2005). Using the 2002 acreage in active farm production (1,265,241 acres), the average cost per acre within the ROI in 2002 was $227.21 (USDA 2004). Using 2002 cropland, the cost per acre of agricultural chemicals inputs, including fertilizers and lime, was $7.84 (USDA 2004). Average net cash return per farm within the ROI was $14,389 in 2002 (USDA 2004). The average net cash receipts per acre within the ROI in 2002 were $73.80 (USDA 2004). Table 15 lists the average farm production expenses and return per dollar of expenditure in 2002 for each county in the ROI. Table 16 lists the average value of land and buildings and the average value of machinery and equipment per farm in 2002 within each county in the ROI.

Table 15. Average farm production expenses and return per dollar of expenditure in 2002.

Area	Average Size of Farm (acres)	Average Total Farm Production Expense ($)	Average Cost per Acre ($)	Average Net Cash Return per Farm ($)	Average Net Cash Return per Acre ($)	Average Return per $ Expenditure ($)
Oklahoma	404	48,859	121	8,220	20	0.17
Adair	211	55,394	263	15,582	74	0.28
Cherokee	181	52,139	288	23,250	128	0.45
Delaware	203	70,190	346	23,646	116	0.34
Mayes	195	26,696	137	5,999	31	0.22
Sequoyah	177	17,221	97	3,468	20	0.20

Source: USDA 2004

Table 16. Average value of land, buildings, machinery, and equipment per farm in 2002.

Area	Average Size of Farm (acres)	Average Value of Land and Buildings per Farm ($)	Average Value of Machinery and Equipment per Farm ($)
Oklahoma	404	285,730	42,155
Adair	211	240,360	35,214
Cherokee	181	229,729	29,573
Delaware	203	276,410	30,518
Mayes	195	254,562	35,960
Sequoyah	177	186,643	32,755
Source: USDA 2004			

3.7.2.1.4 Agricultural Land Use

In 2002, there were 1,265,241 acres of land in farms including cropland, woodland, pastureland and rangeland, and house lots, etc. This was a 10.6 percent decrease from 1997 (USDA 2004). Table 17 lists the acreage for different agricultural land uses in 1997 and 2002 and the percent change during that period.

In 1997, there were 1,024,267 acres in Oklahoma enrolled in either CRP or the Wetlands Reserve Program (WRP). Of that amount, 6,485 acres were located within the ROI. Five years later (in 2002), enrollment had increased statewide to 1,103,520 acres, while enrollment within the ROI decreased to 2,991 acres. As of December 2005, a total of 1,057,291 acres in Oklahoma were enrolled in CRP (FSA 2005). The average value of Oklahoma cropland in 2005 was estimated at $745 per acre (USDA 2005).

Table 17. Agricultural land uses in 1997 to 2002 and the percent change experienced during that period.

Land Use	Acres in 1997	Acres in 2002	Percent Change
Cropland [1]	648,405	561,415	-13.4
Woodland [2]	249,452	237,459	-4.8
Pastureland and rangeland [3]	470,748	418,674	-11.1
House lots, ponds, roads, wasteland, etc.	46,231	47,693	3.2
CRP and WRP [4,5]	6,485	2,991	-53.9
Total Land in Farms [6]	1,414,836	1,265,241	-10.6

[1] Cropland includes all harvested cropland, cropland used for pasture or grazing, and other cropland

[2] Woodland includes wooded pastureland and wooded non-pastureland

[3] Pastureland and rangeland excludes cropland and wooded pastureland

[4] Operations with land enrolled in CRP or WRP are counted as farms if they received $1,000 or more in government payments.

[5] Acreage from Sequoyah County withheld to avoid disclosing data for individual farms

[6] Total land in farms includes the sum of cropland, woodland, pastureland and rangeland, and house lots, etc.

Source: USDA 2004

3.7.2.1.5 Recreation Spending

According to the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (NSFHWAR), 838,000 State residents of ages 16 and older participated in hunting or fishing-related activities in Oklahoma in 2001. In that same year, approximately 1.1 million residents participated in some sort of wildlife viewing (e.g., observing, photographing, or feeding wildlife) (FWS and USCB 2001).

Oklahoma waters lured roughly 774,000 anglers to the State in 2001. Of that total, 84 percent were residents of Oklahoma and 16 percent were non-residents. Total fishing-related expenditures in 2001 were in the range of $476 million from residents and non-residents. The NSFHWAR established that approximately $212 million went to trip-related expenses, such as food, lodging, and transportation; while $250 million went to equipment for the trip, such as rods, reels, and lines. The remaining $14 million went to other related costs such as membership dues, stamps, permits, and licenses. The 2001 survey data indicated that fishing in Oklahoma decreased by approximately 150,000 anglers from 1996. The 2001 survey also showed that the most popular species among anglers were catfish and bullheads, followed by walleye, sauger, and various panfish (FWS and USCB 2001).

Resident and non-resident hunters totaled 261,000 in the 2001 survey. Residents accounted for 92 percent of those individuals, while non-residents accounted for 8 percent. Hunting-related expenditures amounted to $284 million dollars for the State. Of that amount, $97 million went to trip-related items, $130 million went to equipment-related expenses, and $57 million went to other expenditures such as membership dues and licenses. The NSFHWAR reported the number of hunters in Oklahoma decreased from 297,000 hunters in 1996 to 261,000 hunters in 2001. Of the hunters surveyed in 2001 to determine the preference of species hunted, 212,000 preferred big game species, 131,000 preferred small game species, and 81,000 preferred migratory bird hunting (some individuals hunted in more than one category) (FWS and USCB 2001).

According to the 2001 survey, wildlife viewing activities in Oklahoma were enjoyed by 1.1 million individuals. Wildlife-viewing includes non-consumptive activities such as photographing, feeding, or observing wildlife. These activities created revenue of $193 million in Oklahoma in 2001. Trip-related expenses including transportation, food, and lodging amounted to approximately $69 million; while equipment-related expenses, such as film, cameras, and binoculars, amounted to $111 million. Donations, contributions, memberships, and other related expenses amounted to $13 million. The 2001 survey indicated that the majority of wildlife-viewers leaving their home environment to observe wildlife went most often to woodlands, lakes, and streams (FWS and USCB 2001).

3.8 Environmental Justice

3.8.1 Description

Populations of special concern are identified and analyzed for environmental justice impacts. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that Federal agencies:

> "...make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations...." (59 FR 32, 1995)

Race and ethnicity are two distinct categories of minority populations. A minority population can be described by either category, or by a combination of the two. Race as defined by the U.S. Census Bureau (USCB) includes White, Black or African American, American Indian or Alaskan Native, Asian, and

Native Hawaiian or Other Pacific Islander (USCB 2001). Ethnicity is defined as either being of Hispanic or Latino origin and any race, or not of Hispanic or Latino origin and any race (USCB 2001). Hispanic or Latino origin is further defined as "a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race" (USCB 2001). A minority population can be described as being composed of a minority group and exceeding 50 percent of the population in an area, or the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population (CEQ 1997a).

National poverty thresholds are measured in terms of household income and are dependent upon the number of persons within the household. Individuals falling below the poverty threshold are considered low-income individuals. USCB census tracts where at least 20 percent of the residents are considered poor are known as *poverty areas*. When the percentage of residents considered poor is greater than 40 percent, the census tract is considered an *extreme poverty area* (USCB 1995).

The ROI for this resource analysis includes counties within or partially within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.8.2 Affected Environment

As reported by USCB for year 2000 (2000b), demographics for the non-Hispanic ROI population were 64.3 percent White, 0.8 percent Black or African American, 25.8 percent American Indian or Alaska Native, 0.2 percent Asian, less than 0.1 percent Native Hawaiian or Pacific Islander, and 8.8 percent all other races or combination of races. Hispanic or Latino of any race accounted for 2.6 percent of the population. The ROI is not a location of a concentrated minority population.

The average poverty rate for the ROI in 1999 was 19.7 percent and varied from a high of 23.2 percent in Adair County to a low of 14.3 percent in Mayes County (USCB 2000b). Because approximately 20 percent of the residents are considered poor, the ROI is considered to be a poverty area.

In 2002, American Indians or Alaskan Natives operated 1,281 farms within the ROI; Spanish, Hispanic, or Latino persons operated 137 farms; Blacks or African Americans operated 23 farms; Asians operated 11 farms; Native Hawaiians or Pacific Islanders operated 6 farms; and 298 farms were operated by persons reporting more than one race (USDA 2004). The ROI accounts for 16.1 percent of all minority farm operators within the State of Oklahoma, while these 1,756 farms account for 26.8 percent of the total number of farms within the ROI (USDA 2004).

3.9 Wild and Scenic Rivers

3.9.1 Description

The *Wild and Scenic Rivers Act* established the Wild and Scenic Rivers System to protect rivers that:

> "...with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." (16 USC 28 parts 1271–1287, 1968)

The ROI for this resource analysis includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3.

3.9.2 Affected Environment

There are currently no federally designated wild and scenic rivers within the ROI; however, the Illinois River and its two major tributaries, Baron Fork and Flint Creek, are being studied for inclusion in the National Wild and Scenic Rivers System (Oklahoma Scenic Rivers Commission [OSRC] 1999). In the meantime, Oklahoma legislators have designated six rivers in Oklahoma as scenic rivers. These are the Illinois River, Baron Fork, Flint Creek, Upper Mountain Fork River, Lee Creek, and Little Lee Creek. The Illinois River, Baron Fork, and Flint Creek are in the ROI. These rivers, designated and protected by the *Oklahoma Scenic Rivers Act*, possess unique beauty and resources that provide present and future benefit to the people of the State (82 *Oklahoma Statutes* 21 part 1452, 1970).

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4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences or impacts to resources described in Chapter 3 that may result from implementing the preferred alternative or no action alternative. As this analysis is programmatic and not site specific, resource impacts may not always be quantifiable. In compliance with guidelines contained in NEPA and CEQ regulations, each individual CREP agreement would require a site specific environmental evaluation to be completed by FSA.

4.1 Biological Resources

4.1.1 Wildlife and Fisheries

4.1.1.1 Level of Impact

Significant impacts to wildlife and fisheries would include those actions that resulted in harming, harassing, or reducing those populations to the point they become imperiled or populations of concern, or reducing or adversely altering their habitat.

4.1.1.2 Alternative A—Preferred

Implementation of the preferred alternative would result in long-term, beneficial impacts to both wildlife and fisheries throughout the ROI. Current and historical agricultural practices have limited some of these species, and displaced others from their historical range. By removing portions of land from agricultural production, planting filter strips and riparian forest buffers, and limiting livestock access to riparian floodplains, the proposed CPs would increase the quality and abundance of wildlife and fisheries habitat.

4.1.1.2.1 Wildlife

Wildlife habitat would be restored or enhanced by implementing the proposed CPs. This would result in a beneficial impact to terrestrial and avian wildlife species that frequent the ROI. Establishing filter strips (CP21) would create narrow bands of grasses that would be suitable habitat for ground nesting bird species. Filter strips would provide thermal and nesting cover for ground nesting species, as well as foraging areas for grazing wildlife. Filter strips would also provide nectar and pollination areas for insects. Bermuda and fescue grass may be planted with native species within filter strip areas to create vegetative diversity. Filter strips may require mowing to stimulate vegetative growth. Mowing should take place before or after the nesting time for ground nesting birds, which varies among species.

Establishment of riparian forest buffers (CP22) would significantly benefit terrestrial and avian wildlife within the ROI. Riparian forest buffers would create corridors for wildlife to travel between different habitat types. These travel corridors would also be used for daily and seasonal migration. Riparian forest buffers representing bottomland hardwood forest species would be extremely beneficial to migratory birds, which use these areas for breeding grounds, wintering, and feeding (Anderson and Masters 2004). Hard and soft mast produced in these buffers would provide food, as well as covered feeding areas, for game species such as turkeys, white-tail deer, and squirrels. Riparian forest buffers may be attached to pre-existing vegetation, such as windbreaks or shelterbelts. By attaching buffers to existing vegetation, habitat area would be maximized and fragmentation reduced.

The encroachment of woody vegetation on grasslands has been found to increase predation and brood parasitism on non-game neotropical migrant grassland nesting species. Therefore, woody vegetation such as that in riparian forest buffers should not be planted in grasslands that currently do not contain woody vegetation.

As buffers mature, periodic harvesting of some trees may be necessary. Such harvests may temporarily disrupt daily migration patterns of resident wildlife. The use of best management practices (BMPs) would help ensure these impacts would be minor and temporary.

4.1.1.2.2 Fisheries

Implementation of the proposed CPs would restore and enhance aquatic species habitat as well as improve overall water quality. Establishing filter strips would reduce the amount of sediment, nutrients, and pesticides entering waters (NRCS 2000). Pollutants would be taken up by the vegetation comprising the filter strip, while sediment would settle to the bottom of the strips rather than into water sources. A major impairment to waters within the ROI is turbidity (EPA 2002a). Turbidity, a measure of water clarity, is directly affected by the amount of sedimentation suspended within the waterway. Within slow moving waterways, the settling of sediment can interfere with the feeding and reproduction of some fish. Sedimentation can also limit the hatch of aquatic insects, which are a major component of the food chain (Anderson and Masters 2004). High turbidity can also increase water temperature, which is unfavorable to some aquatic species. Filter strips adjacent to waterways would decrease the amount of sedimentation entering the water; thereby decreasing turbidity. Filter strips would also reduce phosphorus loading by limiting the amount of nutrients entering waterways. An excess of phosphorus, a major impairment to some waterways within the ROI, can cause algae blooms that deplete the waters of dissolved oxygen content (EPA 2002a, NRCS 1994).

Riparian forest buffers would establish woody and non-woody vegetation around water sources within the ROI. Once fully mature, this vegetation would fall over and into waterways and create fish habitat. In small streams, up to 75 percent of the organic food base within the water is provided by detritus, including limbs, leaves, fruit, and insects falling from overhanging branches (Welsch 1991). Downed trees within waterways provide cover areas and create pools, riffles, and gravel beds for spawning areas. Buffer vegetation would filter nutrients and pesticides before they reach the waterways, as well as stabilize stream banks which would limit sedimentation.

4.1.1.3 Alternative B—No Action

Under the no action alternative, lands eligible for CREP enrollment would remain in agricultural production. Wildlife and fisheries habitat would continue to decline in quality and become more fragmented, and impaired waterways within the ROI would be likely to remain as such. Terrestrial, avian, and aquatic species would continue to be exposed to harmful pathogens and poor water quality.

4.1.2 Vegetation

4.1.2.1 Level of Impact

Significant impacts to vegetation would include those actions that resulted in removing or choking out unique or imperiled vegetation, or introducing vegetation that is invasive.

4.1.2.2 Alternative A—Preferred

The preferred alternative would enhance vegetation by establishing CPs, resulting in a beneficial impact to vegetation within the ROI. Vegetation within the ROI has been altered and depleted due to farming, logging, and overgrazing. Filter strips (CP21) would create narrow bands of native vegetation as well as fescue and Bermuda grasses which, although not native to the State, are not invasive. Filter strips would be placed adjacent to streams, ponds, lakes, wetlands, water-filled ditches, groundwater recharge areas, and sinkholes (FSA 2003b).

Riparian forest buffers (CP22) would enhance shrubs, trees, and grasses adjacent to riparian areas. This vegetation would be planted adjacent to perennial or intermittent steams, lakes, wetlands, ponds, seeps, and areas of groundwater recharge (FSA 2003b). Native plants species would be used in the riparian buffers, thus enhancing present vegetation within the ROI. Zone three of the riparian buffer (filter strip area) may also be planted with fescue and Bermuda grasses.

Some herbicides may be used during implementation of the CPs. Herbicides would be pre-approved by the governing Federal agency of the specific site and applied strictly according to label directions to minimize the threat to biological resources within the area.

4.1.2.3 Alternative B—No Action

Under the no action alternative, lands eligible for CREP enrollment would remain in agricultural production. Proposed CPs would not be implemented and native vegetation would continue to be removed for agricultural purposes.

4.1.3 Protected Species and Habitat

4.1.3.1 Level of Impact

Significant impacts to protected species and habitat would include any action that resulted in the harassment or loss of threatened, endangered, or candidate species their defined habitat.

4.1.3.2 Alternative A—Preferred

Nine of the ten protected species in the ROI rely on riparian areas for some sort of habitat. Of the ten species, there would be a beneficial impact to six and a potential adverse impact to two resulting from implementation of the preferred alternative. The remaining two species would either be unaffected or may benefit slightly.

The proposed CPs would benefit Ozark cavefish, Arkansas darter, and Neosho mucket. Ozark cavefish and Neosho mucket populations have been limited due to water quality degradation, and filter strips and riparian forest buffers would improve water quality within the ROI. These CPs would also decrease sedimentation within waterways and improve water clarity. Sedimentation has caused high turbidity impairments within the Illinois River, where populations of Neosho muckets are found. In addition, these species would profit from cooler water temperature due to the shade provided by the overhanging vegetation of mature riparian forest buffers.

Installation of riparian forest buffers would benefit gray bats, Indiana bats, and bald eagles. Gray bats and Indiana bats require riparian areas for foraging habitats. Indiana bats forage more on aquatic insects than terrestrial ones, and feed around mature trees that overhang waterways for protection. Riparian forest buffers would provide habitat for the bald eagle, which primarily feeds in riparian ecosystems, and mature woody vegetation would offer perching and nesting sites.

Piping plover and least interior tern habitat consists of bare or sparsely vegetated banks of rivers and lakes, thus implementation of the proposed CPs may have an adverse impact to these species. Even if riparian forest buffers are not installed directly within piping plover and least interior tern habitat, buffers in the habitat vicinity may create an influx of avian and terrestrial predators. Therefore, areas that are certain to support piping plover or least interior tern populations should not be planted with riparian forest buffer vegetation.

The preferred alternative is unlikely to impact the American burying beetle as their habitat is based primarily on the availability of carrion. However, precautions should be taken to ensure that the burying beetle is not present prior to CP implementation.

Ozark big-eared bats would be mostly unaffected by the proposed CPs, but may benefit slightly when the riparian forest buffers are mature. These bats occupy edge areas between grasslands and forest areas to feed, and they may utilize the edge created by the forest buffers if other habitat requirements are met nearby.

To comply with the requirements of Section 7 of the *Endangered Species Act* (16 USC 35 parts 1531 et seq., 1988), FSA would ensure that all conservation plans consider whether threatened, endangered, or candidate species or critical habitat are present within each specific site. FSA must also consult with the appropriate FWS staff on a programmatic level to determine what level of site specific review may be necessary.

4.1.3.3 Alternative B—No Action

Under the no action alternative, the degradation of vegetation, wildlife habitat, and aquatic habitat would continue. Habitat would decline in quality and become more fragmented, and impaired waterways within the ROI would be likely to remain as such. Protected species would continue to be exposed to harmful pathogens and poor water quality.

4.2 Cultural Resources

4.2.1 Archaeological Resources

4.2.1.1 Level of Impact

Significant impacts to archaeological resources would include those actions which resulted in: 1) directly or indirectly altering the characteristics of the property that qualify it as a historic cultural resource; 2) causing destruction or damage to the property; 3) removing parts or all of the property from its historic location; 4) introducing any permanent atmospheric, audible, or visual elements that diminish the integrity of the historic property; 5) the neglect of a registered property; or 6) the disturbance of important religious sites or sites of cultural significance to American Indians.

4.2.1.2 Alternative A—Preferred

There is the potential that archaeological resources would be encountered during implementation of the preferred alternative. Activities that require any excavation to accomplish tasks associated with CP installation may have impacts to recorded and unidentified archaeological resources.

As the Oklahoma CREP agreement does not address specific sites, detailed cultural resources information can not be offered in this PEA. All actions would be reviewed with OSHPO during the planning and implementation phases of the proposed action. When specific sites to be enrolled in CREP are identified by legal description, a Class I literature search, as appropriate, would be conducted on these properties to determine if further investigation or mitigation would be warranted.

4.2.1.3 Alternative B—No Action

Under the no action alternative, agricultural practices that occur on lands within the ROI would continue. Though the continuation of farming and other agricultural practices on previously disturbed land would not be expected to impact archaeological resources, any change in these activities that would disturb previously intact areas may result in impacts to known or unidentified archaeological properties.

4.2.2 Architectural Resources

4.2.2.1 Level of Impact

Significant impacts to architectural resources would include those actions which resulted in: 1) directly or indirectly altering the characteristics of the property that qualify it as a historic cultural resource; 2) causing destruction or damage to the property; 3) removing parts or all of the property from its historic location; 4) introducing any permanent atmospheric, audible, or visual elements that diminish the integrity of the historic property; 5) the neglect of a registered property; or 6) the disturbance of important religious sites or sites of cultural significance to American Indians.

4.2.2.2 Alternative A—Preferred

There is the potential that architectural properties would be encountered during implementation of the preferred alternative. Activities associated with CP installation may have impacts to recorded and unidentified architectural resources.

As the Oklahoma CREP agreement does not address specific sites, detailed cultural resources information can not be offered in this PEA. All actions would be reviewed with OSHPO during the planning and implementation phases of the proposed action. When specific sites to be enrolled in CREP are identified by legal description, a Class I literature search, as appropriate, would be conducted on these properties to determine if further investigation or mitigation would be warranted.

4.2.2.3 Alternative B—No Action

Under the no action alternative, agricultural practices that occur on lands within the ROI would continue. Though the continuation of farming and other agricultural practices on previously disturbed land would not be expected to impact archaeological resources, any change in these activities that would disturb previously intact areas may result in impacts to known or unidentified archaeological properties.

4.2.3 Traditional Cultural Properties

4.2.3.1 Level of Impact

Significant impacts to TCPs would include those actions which resulted in: 1) directly or indirectly altering the characteristics of the property that qualify it as a historic cultural resource; 2) causing destruction or damage to the property; 3) removing parts or all of the property from its historic location; 4) introducing any permanent atmospheric, audible, or visual elements that diminish the integrity of the historic property; 5) the neglect of a registered property; or 6) the disturbance of important religious sites or sites of cultural significance to American Indians.

4.2.3.2 Alternative A—Preferred

There is the potential that TCPs would be encountered during implementation of the preferred alternative. Activities associated with CP installation may have impacts to recorded and unidentified TCPs.

As the Oklahoma CREP agreement does not address specific sites, detailed cultural resources information can not be offered in this PEA. All actions would be reviewed with OSHPO during the planning and implementation phases of the proposed action. When specific sites to be enrolled in CREP are identified by legal description, a Class I literature search, as appropriate, would be conducted on these properties to determine if further investigation or mitigation would be warranted.

4.2.3.3 Alternative B—No Action

Under the no action alternative, agricultural practices that occur on lands within the ROI would continue. Though the continuation of farming and other agricultural practices on previously disturbed land would not be expected to impact TCPs, any change in these activities that would disturb previously intact areas may result in impacts to known or unidentified TCPs.

4.3 Water Resources

4.3.1 Surface Water

4.3.1.1 Level of Impact

Significant impacts to surface water would include those actions that permanently increase runoff or pollutants entering rivers, streams, or lakes; adversely change water supply or storage; or cause violations of State or Federal laws or regulations.

4.3.1.2 Alternative A—Preferred

Implementation of the preferred alternative would have a long-term beneficial effect on surface water quality throughout the ROI. Filter strips established on areas adjacent to water resources would reduce the runoff of sediments, nutrients, pesticides, and other contaminants by slowing the velocity of runoff. A decrease in velocity would allow sediments to settle and soluble pollutants to be taken up by vegetation before reaching waterbodies. Research indicates that filter strips can reduce sediment loading by 56–95 percent (Leeds, Brown, Sulc, and VanLieshout 1994). Filter strip efficiency depends on rainfall, runoff conditions, soil characteristics, slope, width of the filter strip, and the species of vegetation planted.

Removing land from agricultural production would reduce erosion and sedimentation of waterways because there would be less tillage to produce crops. Less sediment entering the waterways would reduce turbidity, a major impairment to some waters within the ROI. Reduced turbidity would allow aquatic vegetation to persist, and this may increase the dissolved oxygen content within the water. Low dissolved oxygen content is another impairment of waterways within the ROI.

Though filter strips are more efficient at trapping sediment than soluble nutrients, they will trap sediment-bound nutrients, such as phosphorus and ammonium, with some efficiency (Leeds et al. 1994). Removing phosphorus and nitrogen from water sources reduces algae blooms that deplete the oxygen content in surface water.

The implementation of riparian forest buffers would improve water quality throughout the ROI by reducing the effects of pollution, nutrients, and sedimentation runoff. Phosphorus loading would be reduced, and the shade provided by overhanging vegetation would cool water temperatures and increase the capability of the water to retain dissolved oxygen. Decreasing sedimentation would reduce the chance of flooding. Large deposits of sediments can build up the floor of waterways and reduce the amount of water that can be held, which greatly increases the potential for flooding in high risk flooding areas (Welsch 1991).

Installation of CPs may involve the clearing of vegetation and some soil disturbance. These activities may result in high levels of sediment runoff, resulting in temporary adverse impacts to surface water quality. The use of filter fencing or similar mitigation practices and compliance with local and State regulatory requirements, such as obtaining stormwater pollution permits for construction sites over 1 acre, would reduce these impacts (ODEQ 2002b).

4.3.1.3 Alternative B—No Action

Under the no action alternative, rivers, streams, and lakes throughout the ROI would continue to be subject to impairments such as high nutrient loading, turbidity, low dissolved oxygen content, high sedimentation levels, and the presence of pathogens.

4.3.2 Groundwater

4.3.2.1 Level of Impact

Significant impacts to groundwater would include those actions that permanently increase pollutants entering groundwater; adversely change water supply or storage; or cause violations of State or Federal laws or regulations.

4.3.2.2 Alternative A—Preferred

Groundwater resources within the ROI would benefit from the preferred alternative. Groundwater is directly connected to surface water, and much of the groundwater contamination throughout the U.S. is connected to surface water contamination (Welsch 1991). Therefore, reducing contaminants in surface water may have a beneficial effect on the groundwater with which it is connected. In addition, vegetation within the filter strips and riparian forest buffers would slow the rate of rainwater flow over the ground, creating greater rates of aquifer recharge.

4.3.2.3 Alternative B—No Action

Under the no action alternative, groundwater resources in the ROI would continue to be subject many of the same impairments as those of surface waters including high levels of nutrients and the presence of pathogens. Rates of groundwater recharge may decrease over time if vegetation is removed due to expanding agricultural practices.

4.3.3 Wetlands

4.3.3.1 Level of Impact

Significant impacts to wetlands would include those actions that permanently diminish or degrade wetland resources.

4.3.3.2 Alternative A—Preferred

Implementation of the preferred alternative may have a beneficial effect on any wetlands located adjacent to lands enrolled in CREP. Wetlands rely on groundwater flow for seasonal recharge. By reducing the amount of pollutants and sediments entering surface water and groundwater in the ROI, there would be a beneficial effect on the water quality of adjacent wetlands.

The removal of some land from agricultural use may affect the number and size of wetlands formed by anthropogenic features associated with agricultural activities such as reservoirs and drainage channels; however, this effect is expected to be minor.

4.3.3.3 Alternative B—No Action

Under the no action alternative, wetlands in the ROI would continue to be subject to high sedimentation levels, excess nutrients, and the presence of pathogens.

4.3.4 Floodplains

4.3.4.1 Level of Impact

Significant impacts to floodplains would include those actions that cause destruction to or reduce the function of floodplains.

4.3.4.2 Alternative A—Preferred

The preferred alternative would have a minor beneficial effect on floodplains. Restricting livestock access to floodplains would decrease stream bank erosion and improve overall function of the floodplains.

4.3.4.3 Alternative B—No Action

Under the no action alternative, livestock access to floodplains, and the resulting overland flow of pathogens to streams and stream bank erosion, would remain unchanged.

4.4 Soil Resources

4.4.1 Level of Impact

Significant impacts to earth resources would include those actions that erode or diminish unique topographical features or soil types, permanently increase erosion and sedimentation, or alter or destroy paleontological resources.

4.4.2 Alternative A—Preferred

Long-term beneficial impacts to topography and soils are expected to occur under Alternative A. Implementation of the proposed CPs would result in localized stabilization of soils and topography as a result of decreased erosion and runoff. Limiting livestock access to floodplains would reduce stream bank destabilization, resulting in reduced rates of erosion. Establishing permanent vegetation on former croplands would reduce erosion by wind and water.

Short-term disturbances to soils during implementation of CPs may include tilling or installation of various structures such as fences, breakwaters, and roads. These activities may result in temporary increases in soil erosion. Although managed haying may be conducted on enrolled CREP lands, the amount of land used for these activities is unlikely to change from current conditions. There would be negligible effects to paleontological resources.

4.4.3 Alternative B—No Action

Under the no action alternative, the current rates of erosion and the changes in topography resulting from erosion would continue. There would be negligible effects to paleontological resources.

4.5 Air

4.5.1 Level of Impact

Significant impacts to air quality would include those actions that: 1) cause or contribute to a violation of any national, State, or local ambient air quality standard; 2) expose sensitive receptors (e.g., residential areas, hospitals, daycare facilities, elder care facilities, elementary schools, parks, and outdoor restaurants) to substantially increase pollutant concentrations; or 3) cause emissions which exceed any significant criteria established by the State Implementation Plan.

4.5.2 Alternative A—Preferred

Implementation of Alternative A would result in the establishment of filter strips and riparian buffers. These CPs would minimize the amount of exposed soil, which would have a beneficial impact to local air quality. Oklahoma has relatively clean air and it is not expected that implementing either of the proposed CPs would result in significant impacts to air quality.

CPs may also enhance carbon sequestration, which is the storage of carbon in its stable form. The planting of new vegetation would remove and sequester carbon dioxide from the atmosphere and help reduce greenhouse gases.

Implementation the proposed CPs may include activities such as tilling, burning, and installation of various structures. These activities may temporarily impact local air quality. Tilling may temporarily increase particulate matter in the immediate area. This can be mitigated by watering exposed soil before and after work. Despite the temporary increase in particulate matter, effects to air quality due to implementation of the proposed CPs would not be significant nor long term.

Installing various structures such as roads, firebreaks, and fences may require the temporary use of heavy-duty diesel construction vehicles. Primary emissions from construction vehicles include carbon monoxide and some particulate matter. BMPs would be used during construction activities to reduce the amount of emissions.

Prescribed open burning would release pollutants into the environment such as particulates, partially consumed fuel, liquid droplets, carbon monoxide, hydrocarbons, and nitrogen oxides. The quantity and distribution of these pollutants would depend on the type of vegetation that is being burned, the configuration of the burned material (material heaped or organized in rows), and the weather at the time of burning. Moderate prescribed burning would not likely have a significant impact to local air quality.

4.5.3 Alternative B—No Action

Under the no action alternative, existing air quality conditions would not change.

4.6 Recreation

4.6.1 Level of Impact

Significant impacts to recreational resources would include those actions that drastically change the quantity of lands used for public recreation, or that degrade any aspect of these lands such as aesthetics, fisheries, wildlife, or water quality.

4.6.2 Alternative A—Preferred

Implementing the preferred action would result in a long-term beneficial impact to recreation resources within the ROI. Creating or enhancing quality wildlife habitat would increase the abundance of species frequenting the ROI and provide more successful opportunities for hunting and wildlife viewing. The proposed CPs would promote good water quality, which would support more abundant and healthier fish populations in the ROI as well as downstream. This would result in increased fishing opportunities.

The growth in hunting, wildlife viewing, and fishing opportunities may increase monies received from the purchase of licenses and from other recreational spending, potentially improving socioeconomic conditions in the area (see Section 4.7, *Socioeconomics*). Implementation of the proposed CPs would increase the desirability of land to be used for non-consumptive outdoor activities such as swimming, boating, and camping due to improved aesthetics.

Construction activities associated with CP implementation may temporarily displace some wildlife species. These activities may also temporarily increase sedimentation entering waterways, which would have an adverse impact to some fish species and water-related recreation. The adverse impacts associated with construction activities would be temporary and minimized using BMPs.

4.6.3 Alternative B—No Action

Under the no action alternative, the current condition of water and lands used by the public for recreation would remain unchanged.

4.7 Socioeconomics

4.7.1 Level of Impact

Significant impacts to socioeconomics would include those activities which may induce changes in population density, growth rate, or patterns of land use.

4.7.2 Alternative A—Preferred

Implementation of the preferred alternative would result in a maximum of 19,035 acres of land being conserved for a 15-year period. This would result in a positive net present value for the land rentals.

This action would result in a maximum loss of 19,035 acres of agricultural land. In 2002, there were 4,769 farm workers on the 1,265,241 acres of farms within the ROI, accounting for a payroll of $28.1 million (USDA 2004). Removing 19,035 acres from agricultural production would decrease the land in farms to 1,246,206 acres and may result in the loss of 72 farm worker positions at an estimated cost of $424,225 per year when all 19,035 acres are under contract. The loss of these positions would account for approximately 1.5 percent of the farm worker positions available in 2002. The loss of production on 19,035 acres would reduce the amount of total farm production expenditures, less hired and contract labor, by $3.87 million per year, or 1.3 percent of the total 2002 farm production expenditures (USDA 2004).

Based on average Oklahoma rental rates, CREP enrollment is estimated at an average of $73.50 per acre for the 19,035 acres proposed (Appendix A). In addition, a maintenance payment of $10.00 per acre and a maintenance fee for riparian buffers in the amount of 20 percent of the rental payment would be provided to participants for an estimated average of $98.20 per acre per year. Participants would receive a one-time signing incentive fee of $150.00. OCC and FSA would cost share with producers for up to 83 percent of the eligible reimbursable costs of all approved CPs, and FSA would also issue a practice incentive payment equal to 40 percent of the CP establishment costs. On average, this establishment cost is anticipated to be $1,156 per acre. The total net present value is $22.0 million over 15 years (Appendix F).

Hines, Sommer, and Petrulis (1991) noted that enrolling lands into CRP adversely affected agricultural-based industries such as transportation and processing. The replacement of expenditures that would have supported local agriculture-related industries with CRP payments is often spent on other commodities within the local community. Impacts are generally greater where agriculture is the dominant economic activity and CRP enrollment is high.

Feather, Hellerstein, and Hansen (1999) reported non-market benefits associated with the implementation of CRP. For annual consumer surplus in Oklahoma, these would include an estimated $12.14 per acre for wildlife viewing and $0.29 per acre for freshwater recreation activities for a total consumer surplus per acre from CRP of $12.43. Total annual consumer surplus attributable to CRP for the U.S. equated to $13.45 or about twice that of the consumer surplus generated by CRP activities in

the Southern Plains Region, which includes Oklahoma. It is expected that the proposed CPs would improve wildlife and fisheries habitat, which in turn may improve hunting, fishing, and wildlife viewing opportunities in the ROI. These increased opportunities may generate recreation-related economic activity within and around the ROI.

4.7.3 Alternative B—No Action

Under the no action alternative, CREP would not be implemented and socioeconomic conditions would continue to follow the trends associated with the ROI, Oklahoma, and Southern Plains Region of the U.S.

4.8 Environmental Justice

4.8.1 Level of Impact

Significant impacts to environmental justice would include those activities in which low income or minority populations are adversely affected or unfairly compensated, or all affected individuals are not allowed equal access to the decision making process.

4.8.1.1 Alternative A—Preferred

The ROI would be considered a poverty area because approximately 20 percent of the residents fall below the poverty threshold. The preferred alternative would remove up to 19,035 acres from agricultural production. Extrapolating from the total number of farm workers per total acres in Oklahoma, the removal of 19,035 acres may result in the loss of 72 farm workers. It is likely that these 72 farm workers are included in the low-income population of the ROI.

The preferred alternative is expected to generate other non-farm employment activities within the ROI. For example, the initial installation of CPs may create temporary jobs. CP maintenance activities required over the life of each CREP contract may also create positions that would take the place of those lost when lands are removed from production.

Research has shown that CRP rental payments are often spent on other commodities within the local community, replacing the farm expenditures that are lost when land is removed from production for CRP (Hines, Sommer, and Petrulis 1991). Therefore, CREP payments are anticipated to create additional non-farm employment within the community.

Under NEPA, the identification of a low income or minority population does not preclude the proposed action from going forward. It does, however, compel Federal agencies to pay special attention to mitigation strategies, monitoring needs, and preferences expressed by the affected population.

4.8.1.2 Alternative B—No Action

There would be no impacts to minority populations or low-income populations under the no action alternative.

4.9 Wild and Scenic Rivers

4.9.1 Level of Impact

Significant impacts to wild and scenic rivers would include those activities that alter, degrade, or diminish any river within the National Wild and Scenic Rivers System. Although no such rivers are present within the ROI, there are three State-designated scenic rivers in the ROI.

4.9.2 Alternative A—Preferred

Implementation of the preferred action would have a long-term beneficial effect on surface water quality throughout the ROI as detailed in Section 4.3.1., *Surface Water*. This includes the scenic rivers protected by the *Oklahoma Scenic Rivers Act* (82 *Oklahoma Statutes* 21 part 1452, 1970), which are the Illinois River, Baron Fork, and Flint Creek in the ROI. In addition, implementation of the preferred action would prevent construction of buildings on lands enrolled in CREP for the term of the contract.

Installation of CPs may involve the clearing of vegetation and some soil disturbance. These activities may result in high levels of sediment runoff, resulting in temporary adverse impacts to the water quality of the scenic rivers. The use of temporary filter fencing or similar mitigation practices would reduce these potential impacts.

4.9.3 Alternative B—No Action

Under the no action alternative, the scenic rivers in the ROI would continue to be subject to impairments such as high phosphorus loading, turbidity, low dissolved oxygen content, high sedimentation levels, and the presence of pathogens.

5.0 CUMULATIVE EFFECTS

5.1 Introduction

As defined by CEQ regulations:

> "Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency ('Federal or non-Federal') or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR 30 part 1508.7, 2005)

CEQ guidance suggests that the first steps in assessing cumulative impacts involve defining the scope of the proposed action and other actions, and evaluating the nature of potential interactions between the actions (CEQ 1997b). Scope must consider geographic and temporal relationships between the proposed action and other actions. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide even partially in time would tend to offer a higher potential for cumulative effects.

For the purpose of this analysis, the ROI includes land within the Tenkiller and Spavinaw watersheds proposed for CREP enrollment and described in Section 1.3. The primary sources of information used to identify reasonably foreseeable future actions are public documents prepared by Federal, State, and local government agencies.

5.2 Past, Present, and Reasonably Foreseeable Actions

The Oklahoma NRCS manages the implementation of several programs that are focused on conserving and enhancing natural resources within the State. These programs are summarized in the following subsections to demonstrate the types of past, present, and reasonably foreseeable future actions that may occur in the ROI.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) provides technical, financial, and educational assistance for farmers and ranchers to address natural resources concerns on their private working lands. EQIP promotes agricultural production and environmental quality as compatible national goals and provides up to 75 percent cost-share assistance of certain CPs. Oklahoma received over $7.5 million in 2002 from NRCS for EQIP; however, funding has not kept pace with requests for cost-share assistance (NRCS 2006).

Farm and Ranch Land Protection Program

The Farm and Ranch Land Protection Program (FRPP) (formerly the Farmland Protection Program) is a voluntary program that aids farmers in keeping their lands in agricultural production (NRCS 2006). This program provides matching funds to local, tribal, or State government entities and some non-governmental organizations with existing farm and ranch land protection programs to purchase conservation easements. A minimum of 30 years is required to be qualified for an easement; however, priority is given to applications with perpetual easements. Landowners involved with this program agree not to convert their land to non-agricultural uses, and to implement a conservation plan for any highly erodible land.

Grassland Reserve Program

The Grassland Reserve Program (GRP) is a voluntary program that allows landowners to restore rangeland, pastureland, shrubland, and some other lands to grassland, while retaining these areas as grazing lands (NRCS 2006). GRP emphasizes support for grazing operations, plant and animal biodiversity, and grasslands most vulnerable to conversion to cropland, urban development, or other uses.

Healthy Forests Reserve Program

The Healthy Forests Reserve Program (HFRP) is a voluntary program that aides in restoring and enhancing forest ecosystems to improve biodiversity, promoting the survival and persistence of protected species, and enhancing carbon sequestration (NRCS 2006). This program is authorized to be carried out until 2008. Eligible lands must be privately owned and have the potential to host protected species or their habitat, improve biological diversity, or increase carbon sequestration.

Soil and Water Conservation Assistance Program

The Soil and Water Conservation Assistance Program (SWCAP) is a voluntary program that provides incentive payments and cost-share payments to ranchers and farmers who actively address threats to water, soil, and other resources such as grazing lands, wildlife habitat, and wetlands (NRCS 2006). Eligible lands must be owned or controlled by the land owner and may be enrolled in 5 to 10 year contracts.

Wetlands Reserve Program

WRP is a voluntary program that provides financial and technical assistance to landowners who are actively addressing wetland, soil, water, wildlife habitat, and related issues. This program enrolls eligible lands in 30-year easements or cost-share agreements. As of 2001, there were a total of 122 contracts in Oklahoma encompassing over 28,171 acres (NRCS 2006).

Wildlife Habitat Incentives Program

The Wildlife Habitat Incentives Program (WHIP) is a cost-share program that assists landowners in developing and improving wildlife habitat on their private lands (NRCS 2006). Plans are established with the help of NRCS and local conservation districts to fulfill the landowner's goals for improving wildlife habitat. Eligible land must be owned or controlled by the landowner, and may not enrolled in other specified programs.

5.3 Cumulative Effects Matrix

When considered in combination with other past, present, and reasonably foreseeable future actions, the incremental impact of the proposed action is expected to result in net beneficial impacts to biological resources, water resources, soil resources, and recreation in the watersheds proposed for CREP enrollment and in waters downstream (Table 18). No adverse cumulative impacts to any other resource discussed in Chapter 3.0 are expected.

Table 18. Cumulative effects matrix.

Resource	USDA Programs: EQIP, FRPP, GRP, HFRP, SWCAP, WRP, and WHIP	Cumulative Effects when combined with the Proposed Action
Biological Resources	The majority of these programs incorporate practices that provide restoration and enhancement of wildlife and fisheries habitat, vegetation, and water quality in their overall goals. These programs provide long-term beneficial impacts to biological resources.	The proposed action would enhance and restore wildlife and fisheries habitat and vegetation within the ROI. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit wildlife and fisheries, vegetation, and protected species.
Cultural Resources	There is potential for cultural resources to be impacted when these programs are initiated on previously undisturbed ground. OSHPO review, as appropriate, of all proposed actions prior to implementation helps to ensure that cultural resources are protected and preserved.	The proposed action has the potential to impact cultural resources. Consultation with OSHPO would be conducted prior to implementation activities to ensure cultural resources are not adversely impacted. Because the proposed action and USDA programs both require OSHPO consultation, no cumulative impacts to cultural resources would be expected.
Water Resources	Several of these programs are designed to improve water resources by planting shrubs, trees, and grasses in riparian areas and on floodplains to reduce pollution runoff to surface water and to allow for greater rates of groundwater recharge. WRP specifically restores and enhances degraded wetlands. These programs contribute long-term beneficial impacts to water quality.	The focus of the proposed action is on improving water quality in the ROI. The amount of pollutants and sediments entering waterways would be reduced by planting grasses, trees and shrubs. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit water resources.
Soil Resources	The majority of these programs establish vegetation on erodible lands as a practice to achieve their overall goal. This increases soil stability and reduces erosion, and has a long-term beneficial impact to soil resources.	Implementation of the proposed action would involve planting permanent vegetation, which would benefit local soil resources. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit soil resources.
Air	The programs which restore and enhance vegetation and reduce local soil erosion may indirectly improve air quality.	Vegetation planted under the proposed action would reduce local soil erosion and may also improve air quality, although to what extent can not be quantified. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit air quality. Oklahoma already has air quality that meets or exceeds Federal and State standards.
Recreation	These programs are implemented on private lands, so benefits to areas used by the public for recreation are limited. However, there may be slight benefits to this resource in the form of improved	The proposed action would be implemented on private lands, but may also benefit wildlife and fisheries habitat and aesthetics on nearby public lands. When combined, the proposed action

Resource	USDA Programs: EQIP, FRPP, GRP, HFRP, SWCAP, WRP, and WHIP	Cumulative Effects when combined with the Proposed Action
	wildlife and fisheries habitat, which may result in increased hunting, wildlife viewing, and fishing opportunities on nearby public lands. Improved aesthetics would also benefit recreation.	and USDA programs may result in cumulative impacts that benefit recreation.
Socioeconomics	The majority of these programs provide incentives focused on providing for more environmentally-sound farming and land use practices. The implementation of the conservation practices and expenditure of the incentives produce positive economic benefits, in addition to the economic benefits resulting from more environmentally-sound farming and land use practices.	The proposed action would provide incentives, rental payments, and maintenance fees which may offset some farm job losses. When combined with other USDA programs, the cumulative impact is expected to be negligible.
Environmental Justice	The majority of these programs provide incentives and/or education opportunities focused on providing for more environmentally-sound farming and land use practices. This would potentially produce new opportunities for low income or minority workers in the ROI in pursuing job prospects that support more environmentally-sound farming and land use practices.	The proposed action would potentially provide new employment opportunities that support more environmentally-sound farming and land use practices. When combined with other USDA programs, the cumulative impact may be increased employment opportunities and a more stable work environment for low income or minority workers in the ROI.
Wild and Scenic Rivers	Programs designed to enhance surface water quality also provide long-term beneficial impacts to wild and scenic rivers.	The overall goal of the proposed action is to improve water quality, and as such, water quality of the scenic rivers within ROI would also be improved. When combined, the proposed action and USDA programs would result in cumulative impacts that benefit scenic rivers.

5.4 Irreversible and Irretrievable Commitment of Resources

As required by NEPA, any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented must be identified in environmental analyses. Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the effect that this use may have on future generations. Irreversible commitments are those that consume a specific resource that is renewable only over a long time period. Irretrievable commitments are those that consume a specific resource that is neither renewable nor recoverable for use by future generations. No irreversible or irretrievable resource commitments are expected from implementation of the proposed action.